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POWER AND HEALTH THROUGH PROGRESSIVE EXERCISE

GEORGE ELLIOT FLINT

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POWER AND HEALTH
THROUGH PROGRESSIVE EXERCISE

GEORGE ELLIOT FLINT.

Power and Health
Through
Progressive Exercise

BY

GEORGE ELLIOT FLINT

With an Introduction by

AUSTIN FLINT, M.D.

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PREFACE

THAT the vast majority of men and women are, physically, not what they should be is an undisputed fact. Why? As all desire to be strong and healthy, why are they not so? There are several reasons. In the first place, the many methods of physical culture do not accomplish what they claim; in the second place, they are uninteresting. Those who go through routine drills with light chest-weights, wooden dumb-bells, wands, or Indian clubs, have "faith" that such exercises will make them strong and symmetrical, but they *see* no special result; they have simply been assured that those exercises are "good" for them. No man, trained by light exercises alone, can *do*, either with weights or on apparatus, what amounts to anything. Small wonder, therefore, when he asks, "Of what *practical* use is all this exercise?"

So long as the light-weight system is declared to be the best method of physical culture, so long will the people's interest in physical culture remain apathetic. For, however much a particular system's potentiality for good be reiterated, it will yet be impossible to persuade the majority of people to adopt it, if it itself fails to show practical worth. Again, even a *truly* good system would hardly become popular, did it lack the vital element of interest. And a light-weight system unquestionably lacks interest. It is a delusion often demonstrated, to believe that anyone will practice systematically that which is uninteresting; and what is not practiced systematically is useless as a means of culture.

The crying need in physical culture to-day is for a system that will first inspire interest, and then produce perceptible results. The Progressive System to be delineated inspires a two-fold interest: It introduces the important element, competition; and it enables the subject to see results growing under his hand. When a man can practically demonstrate to himself

each day that he is gaining strength, he will continue his training; he is not likely to continue it otherwise.

There is much value in competition. Parallel bars and dumb-bell classes may be formed in gymnasiums, each member of which should strive—within physiological limits—to outdo the other members. Thus is created as great an interest in competitive gymnastics and weight lifting as that which has always characterized competitive athletics.

It may safely be said that no one will work hard and steadily at anything unless he has a definite object in view. Men who work in gymnasiums in a desultory sort of way, first with this apparatus, and then with that, soon grow tired and give up; whereas others who constantly and ambitiously strive, on each exercising day, to outdo themselves, finally learn to do what others cannot do—something that is worth while. After a man has learned to handle, in a variety of ways, a heavy weight or weights, to do a remarkable feat of strength, or to display surprising activity as well as

strength on some apparatus, he glories in his prowess; and the chances are that he will, for a long time, remain capable as an athlete, if only for his pride's sake.

It must not be thought, however, that this book deals wholly with heavy gymnastics, weight-lifting, and feats of strength. Many light exercises are given as being valuable to promote elasticity and suppleness; and, in addition to these,—as an apprenticeship of *moderate* exercises is absolutely necessary in order that one may become capable of the simplest exhibition of force,—many intermediate exercises are carefully described, and their effects discussed. The effects of common indoor and outdoor athletic sports and exercises are gone into. All which, it is hoped, will make this volume a complete manual of physical culture, suitable alike for those boys and girls, men and women, who may wish, without the aid of a teacher, to make the best of their bodies.

In answer to a thought likely to present itself to some readers, namely, that most persons desire vigorous health rather than great

strength, I would state at the outset that I propose to prove that those exercises which do not produce considerable strength, do neither produce a high health; in short, that in strength, and in strength only, is health. Exercises having little effect on the strength have just as little effect on the health. This is what I hope clearly to demonstrate, asking the public to suspend judgment until the views herein contained have had a complete hearing. I believe that delicate persons can attain neither health nor strength, unless, by a progressive course of training, they gradually render their bodies capable of sustaining at least a fair amount of some kind of general vigorous work. Strength is worth while, because health—which, as will be shown, depends on strength—is worth while.

By the courtesy of Mr. MacLevy the parallel bar photographs were taken in his gymnasium, adjoining the Hotel St. George, in Brooklyn.

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INTRODUCTION

A NOT inconsiderable personal experience in gymnastics, and an extended field of observation of others who have faithfully and persistently "worked" in the gymnasium, have led me to entertain decided views in regard to the relative value of different methods employed to develop and maintain muscular power. It is manifestly unnecessary to discuss the advantages of gymnastics and athletics, used intelligently and moderately, to those engaged in sedentary pursuits, from the point of view of a physiologist and physician. More than one-half the weight of the body of a fairly developed man or woman is muscular tissue; and if we add the motor nervous system, the bones, the vascular systems and most of the glands—parts concerned chiefly in muscular action and nutrition—it becomes evident that animal life involves movement more than anything else, and, of necessity, muscular action.

INTRODUCTION

The *mens sana in corpore sano* aphorism means that full development and normal operation of the brain can hardly exist in a body that is not sound; and no part of the body can be sound unless there is a proper exercise of its functions. This applies with special force to the muscular system and the motor nerves.

I quite agree with the author of this book in regard to the value of so-called heavy exercises and the great importance of exercises that excite interest and lead to results more or less gratifying to the vanity of the individual. Light exercises are well enough as a preparation to more severe muscular effort; but they usually are monotonous and tiresome and lead to little result. Much less time employed in more severe but shorter efforts develops more muscular power, enables one to accomplish feats of strength and agility and may be made to involve an element of competition that excites and maintains interest. With this system, it is astonishing how much can be accomplished in a short time devoted daily or even less frequently to physical culture. I have observed

that those who confine themselves to light exercises are listless and perfunctory in their work and usually abandon it after a short trial, as uninteresting and useless; while others, exercising more vigorously and for a shorter time, enjoy competition, not mere mental relaxation, and have a feeling of physical well-being that can be appreciated by those only who exercise in the proper way. The reader is referred to the book itself for the development of the ideas that I have briefly expressed.

AUSTIN FLINT.

POWER AND HEALTH

THROUGH PROGRESSIVE EXERCISE

I

THE KIND OF EXERCISE THAT DEVELOPS STRENGTH

THE human body is a complex organism resulting from divisions, subdivisions and re-subdivisions, continued indefinitely, of a single cell; that is to say, it consists of a myriad of cells varying from 1-300th to 1-3000th of an inch in their diameters. These cells have grouped themselves together in various ways, and, in consequence of their having undergone changes, many groups are of different chemical constitution. But each cell is alive, and has the power within itself of breathing, or of taking in oxygen; of eating, or of absorbing nutriment; and of excreting, or of getting rid of waste products.

It is by these processes that cells grow;

hence, anything that stimulates those processes, stimulates the growth of cells. Exercise alone effects this stimulation. Using the muscles, which are made up of masses of cells, causes them to take in a much greater quantity of oxygen than they would ordinarily; also, to absorb more nutriment, and to excrete more waste material.

Thus exercise makes the circulatory, digestive and muscular systems, and the excretory organs—upon all which the muscles depend—work harder than usual; and this rapidly increases the size and strength of the whole physique.

In the present volume it is my purpose to show how ordinary, and even delicate persons can cultivate extraordinary strength and extraordinary health.

Physical man is entirely animal, and he absolutely requires a certain amount of vigorous exercise or he will degenerate. Compare the figure of a house dog, that does not run about much, with that of an active, trained animal that follows either a bicycle or a horse for a

few hours each day. They may be of the same breed, but their shapes are quite different. One has a fat, heavy body with slender and poorly-muscled legs; the other has a contracted belly, a deep, powerful chest and remarkably well-developed limbs.

In a group of average men who do not indulge in any kind of hard physical labor, who walk but little and use their brains much, are two distinct types—the thin man and the fat man. The first is often nervous, dyspeptic, consumptive-looking; his body is poorly nourished, his limbs painfully thin and weak, and his bones stick out as though they would break through the delicate skin. The second type is fat and sleek; his stomach protrudes beyond his chest, and his legs, though not thin, seem too light to support comfortably so huge a body. The pectoral muscles are hardly developed at all; but a small amount of flabby flesh hangs around his chest in deep wrinkles. His arms are slender compared with his trunk, and he possesses about as much strength as a fairly vigorous woman.

By proper exercise it is possible for the thin man to become muscular and much stouter; and, by the same means, the fat man can greatly reduce the girth of his waist, at the same time increasing the size of his chest, shoulders, arms and legs. In short, the former can become more of a man; while the latter, by distributing the superfluous abdominal flesh all over his body, can become more symmetrical.

Nine men out of every ten who go into a gymnasium "to build themselves up," fail. Why? Some of these novices are stout and robust-looking *in their clothes.* Their friends have assured them that they are exceptionally strong, and they thoroughly believe this themselves—until they enter a gymnasium. There, their illusions vanish. They climb up on the parallel bars; but their arms will hardly support their weight, and an attempt to "dip" is a torture. They go to the horizontal bar, where they hang helplessly, unable to "chin" themselves. Nor do they display greater strength with the dumb-bells; two fifty-pounders feel like a ton weight to their weak arms.

Presently an undeveloped "know-all" appears, and advises. He is not a startling example of the benefits of physical culture; still he has read books and "things" on training, and imagines he knows all about it. He selects the largest and fattest of the group and informs him that if he wishes to become *very* strong,—a Sandow, or a Montgomery Irving, —he must use *very* light dumb-bells; which, he says, will greatly develop the muscles without straining them. But just how the muscles are to develop great strength without ever being subjected to considerable strain, he does not pretend to explain; he merely assures the novice that experts have agreed that light weights used for a long time will develop larger and stronger muscles than will heavy weights used for a short time.

This statement, expert opinion notwithstanding, is obviously untrue. What is strength of a muscle, if it is not the ability of that muscle to withstand a heavy strain without injury? And, naturally, a muscle cannot withstand a heavy strain unless it has been gradually accus-

tomed to it. Note that strain is not here used in the sense of overstrain: the former is physiological and normal, the latter is pathological.

Many persons believe feats of strength to be dangerous. This is a mistake. If the subject is ordinarily prudent and has good judgment, *and particularly if he has gradually accustomed his muscles to bear great strain by progressive physical training,* the element of danger is small.

Carefully trained muscles are able to bear, with impunity, enormous strains. No one would affirm that it injures the calf-muscle to bear the entire weight of the body. In any gymnasium you may see men of ordinary strength and extraordinary weight running around a track. One of them may weigh as much as two hundred and fifty pounds. He is running on his toes, if he is running properly. A mathematician who would calculate in foot-pounds the amount of work that each calf-muscle had done at the end of two miles—not a long run—would be surprised at the result. Not only has each in turn supported the man's

entire weight for about sixteen consecutive minutes, but they have hurled that heavy body upward, launched it forward, caught it as it descended, and propelled it over a distance of two miles. Nevertheless when these muscles have become accustomed to this really enormous strain, the work, so far from injuring them, produces not even fatigue.

Now the muscles of the arms, chest and shoulders are of exactly the same physiological structure as the muscles of the legs; therefore, if it is natural and proper for the leg muscles to undergo a great strain, great strain must also be natural and proper for any of the other muscles of the body; always providing, of course, that *the strain be proportionate to the strength of the muscle which is being used.*

No one will dispute the fact that if light work, long-continued, is best to develop the arms and body, then that kind of work is also best to develop the legs. Yet, who would affirm this of the legs? If no one, why does anyone affirm it of the arms? What kinds of legs would we have, had they never supported

and carried around our heavy bodies? Undoubtedly they would be puny, like the arms. And were *all* our voluntary muscles puny, what of their servants—the heart, lungs, stomach, and other organs? Would they need to be robust? Would even the brain be robust? On the other hand, in lieu of reducing our leg-work, suppose we should subject our arms and bodies to the same kind of work as that to which we habitually subject our legs,—namely, to *heavy work*,—would not the heart, lungs, stomach, etc., including the brain, undergo a corresponding increase in strength, simply from having a whole- instead of a half-powerful physique to minister to? An affirmative answer to this question is, I think, logical and indisputable.

An interesting point here presents itself. That the muscles of the arms and those above the waist are smaller and less powerful than those of the legs is due to inheritance and not to their original structure. If man descended, or ascended if you will, from the lower animals, —which theory is now almost universally

accepted,—when he first attained an upright position he no doubt possessed longer and stronger arms than at present. Unequal use, and particularly unequal strain, through countless generations, have caused the difference in the size and strength of the upper and lower limbs that we now observe; and it is probable that in future generations the divergence will be still wider, until, finally, man may become shaped somewhat like the kangaroo; in which animal the disproportion is most marked. It seems not too much to say that were it not for the laboring classes our arms would ere now have become of little use to us for anything but the lightest kind of work.

In order to realize vividly the effect of, not absolute disuse, but, let us say, the cessation of strain, it is only necessary to remark the weakness of the lower limbs, consequent upon lying abed for a few weeks. During that time the legs have been used, for they have been thrown about more or less, daily; but they have been subjected to no *considerable strain;* hence their loss of power. From this, the importance of

subjecting the arm muscles also to strain becomes manifest—most men's arms being in the same condition as a bed-ridden man's legs.

There are thousands of men who, year after year, exercise their arms and shoulders only by swinging them as they walk, pushing a pen over paper, and handling books; and these men confidently assert that walking is the sole exercise they require. They believe that to maintain in good condition considerably less than half of the whole physique, while allowing equally important and more numerous muscles to waste, is amply sufficient for the maintenance of perfect health.

Is it wonderful, therefore, that man is the unhealthiest of animals, and the most unsymmetrical? Animals are almost invariably symmetrical, *because all their muscles habitually undergo nearly equal strains.* It is hoped that these few points will be considered by the vast army of light-weight enthusiasts who expect, through their methods, to acquire god-like figures; also, by the physical culturists who con-

demn big dumb-bells and heavy-weight lifting in all its forms.

Some declare that feats of strength, like putting up big dumb-bells, impose a dangerous strain on the heart and other vital organs. But most feats of strength are performed with the smaller muscles—those of the arms, usually; so if the above objection were valid, how much more dangerous would it be to run or to jump. For the larger muscles, employed in these last-named exercises, are capable of contracting with the greater energy; consequently, they would require a far greater supply of blood than would the smaller muscles, even though these should be strained to their utmost; *and this blood is furnished by the vital organs.* No exercises put so much strain on the heart and lungs as do those involving the lower limbs; plainly because of the greater masses of muscle in that region.

Scientific men say that a perfectly proportioned man measures nearly the same around his biceps and neck as he does around his calf. I have seen several men with these measure-

ments alike, and they seemed well proportioned. Recollect, however, that a measurement of the biceps always includes the triceps. The biceps proper is a much smaller muscle than the calf-muscle, and could never be trained to undergo a strain that the latter could support with ease. But the amount of strain that the biceps can be trained to bear, with impunity, is really astonishing. Later I shall endeaver to show how any muscle can be gradually trained to support comfortably a strain that is very great in proportion to the size of the muscle.

"Muscles consist of bundles of reddish fibers and form by weight more than half of the human body." (F. Lagrange.) The importance of keeping *all* the muscles, "half of the human body," in good condition, is immense.

Nervous stimulus causes a muscle to contract. Will stimulates the nerves. Ordinarily, when a muscle contracts, a few, not all, of the fibers have been stimulated. The stronger the stimulus, the more powerful will be the contraction of the muscle. In order to raise

a heavy weight, a muscle must be energetically stimulated; so, the handling of heavy weights develops more nerve or will power than does the handling of light weights.

With two men of equal muscular development, the one with the stronger will power will outdo the other in a feat of strength; because the former can stimulate a greater number of muscular fibers than the latter. These observations explain, to a certain extent, the strength of insane persons. In acute mania, there is intense nervous excitement; and even ordinary muscles, when under the terrific stimuli of deranged nerves, contract with frightful force. For the same reason, men in a violent passion often display giant strength.

The notion that it is necessary to fatigue a muscle in order to develop it is a fallacy. In my belief, a large number of feeble contractions will tire a muscle completely, and develop it very little; and, conversely, a few powerful contractions will develop a muscle greatly, and fatigue it very little.

That heavy weights cannot fatigue the

muscles in nearly so profound a degree as light weights, a simple experiment will make clear. Take two men. Have one "put up" a pair of light dumb-bells as many successive times as he can. When he stops, his muscles are so exhausted that he is utterly unable to "repeat" even once more. This means, supposing the bells to weigh two pounds each, that he can no longer lift even two pounds; and this almost complete exhaustion is profound and lasting. Now have the second man put up a pair of sixty-five pound weights as many successive times as he can. When he stops, ask him immediately to put up two "fifty-fives," and he will lift them with ease; which proves conclusively that the fatigue produced by the heavier weights has been comparatively slight. The drawn look so often noticeable in men who favor exercises of endurance, is, I think, due to their frequently tiring their muscles completely. Instead of building up, they use up.

Muscles do not grow while working; they grow when they rest, for then the blood more than replenishes with new material what has

been used up by work. Sometimes, however, when men exercise for too long a time, or with weights that are too heavy for them, more material is used up than is replenished; and the subjects *lose* strength. For muscles to grow larger and stronger, their work must be proportioned to their strength, and be punctuated by frequent rests.

Some object to work on the score that, shortly after they have stopped it, they lose the strength which they have so laboriously gained. True. And if one should stop breathing for five minutes, he would, in that space, lose the complex organism that had required a lifetime to perfect itself. Or, if one should remain in bed for, say four weeks, he would acquire an inability to walk—until he had rebuilt up his wasted leg muscles. It is, of course, necessary that one who would *remain* strong, should exert his strength occasionally. But how little trouble! When a man has acquired sufficient strength to perform certain vigorous feats, then, in order to *remain* capable of these feats, it is obligatory that he actually perform them

merely three times each week; which will probably occupy not more than one and one-half out of every 168 hours—surely a small price to pay for continuous strength and health.

F. Lagrange has proved by experiment that, when a muscle is subjected to a heavy strain, the flow of blood to that muscle is much more voluminous and more prolonged than when it is subjected to a slight strain. Hence, a muscle undergoing a heavy strain is best nourished.

But a disciple of light weights will not believe the above truths. His motto is, "Light weights used for a long time will make a man stronger than will heavy weights used for a short time." This type of the would-be athlete exercises in a gymnasium somewhat as follows: He pulls light pulley-weights for about twenty minutes, and exercises with light dumbbells. Afterwards he runs a mile rapidly, and on his toes—or rather, on the balls of his feet, as he should. He then goes to bathe and dress. In the dressing-room he stands for a while

before the mirror to "take a look at his development." What does he see? The muscles of his body and arms, which he has been feeding for years upon light exercises *only*, have remained light and frail; while the muscles of his legs, which have been doing heavy work for the same length of time, are finely developed and look strong enough to support twice as heavy a body. But he learns nothing from this survey of himself. He remains ignorant of the physiological truth, that muscles tend to acquire that structure which enables them best to perform the work that they are frequently called upon to do. Muscles, to do only light work, need not be heavy; therefore, they are not. The principle that whatever is easy to do is not worth the doing, holds good in physical culture as in anything else. Exertion may be disagreeable; but it is beneficial, so long as it is not carried to an extreme limit.

An excellent test of the real strength of our subject's arms, shoulders and chest would be to see how heavy a pair of bells he could put up above his head simultaneously. When two

bells are pushed together in that way there is no possibility of a side movement; they must be raised by the sheer strength of the arms and shoulders. This is called "double-weight pushing." In scientific "single-weight pushing," the bell is raised almost entirely with the strength of the body; while the arm balances the weight, it *pushes* it hardly at all. It is a curious fact that nearly all "strong-men" can put up a heavier weight with one hand than with two hands. Place before such a man as I have described, two fairly heavy dumb-bells. After having been shown how to push them, he tries and fails. But that is not surprising. As our "exerciser" has never done heavy work of any kind, his muscles have been habituated only to slight strain. To put up light weights, even a hundred times in succession, requires only *slight* contractions of the muscles; whereas to put up two heavy weights, simultaneously, requires *powerful* contractions of the muscles: and muscles cannot suddenly learn to contract powerfully.

It may be objected that such a man *is* strong

because he has endurance and can put up two light weights a great number of times. The following definition of strength shows the absurdity of that statement: "Strength of a muscle is its ability to contract with great force, or to bear great strain without yielding or breaking." Moreover, we should bear in mind that light weights seem lighter to a man able to handle heavy weights, than they seem to a man accustomed *only* to light weights; hence, the heavy-weight lifter would probably outdo the latter in repetitions with light weights, as well as in repetitions with heavy weights. Heavy weights, then, develop not only more strength, but more *endurance,* than light weights.

It is my opinion that muscles can be made *very* strong in but one way; that is, by a system of *progressive* physical training, which I shall explain soon. Here I should mention that there is a special way of using light weights that produces some development. The method is as follows: Grasp a pair of light dumb-bells tightly; then "curl" them alternately, by flex-

ing and extending the forearms, while holding the upper arms rigid and pressed against the body. To be at all beneficial the curling movements must be performed as *quickly* as possible, and with great vigor; otherwise, the muscles would undergo no considerable strain, and no development would result. So far from clashing with my theory, this method of development only demonstrates it anew.

Other movements with light dumb-bells cannot be performed in this special way, and, if they could, the *quality* of development that resulted would be hardly desirable; for muscles so trained, though sometimes puffy-looking, are never very strong, owing to the impossibility of light weights, even when used vigorously, putting a really great strain on them. A trial will convince anyone that muscles swelled by the above "light" method are not able to contract strongly enough to raise a heavy weight.

"Light" physical culturists sometimes submit figures showing how much their pupils' muscles have gained in circumference, within

a certain time. But when the question as to what their pupils can *do* with their artificially —and temporarily—swelled muscles is asked, they are silent.

When any man can demonstrate practically and beyond cavil, that men trained by light exercises only, can perform an exercise requiring strength, I, for one, shall believe that light exercises are useful as a means to strength.

In such a demonstration, these two conditions must be observed: First, the subject, before undergoing the light exercises, must be not nearly able to perform the given feat of strength; second, during the whole time of preparation, he must perform *light* exercises only.

Quantity of muscle is of little importance; its *quality* is shown by what it can do.

It is not my contention that light exercises produce no strength whatever; but that they produce so little as to be not useful for this purpose.

Yet light weights and light exercises generally are well-nigh indispensable as *adjuncts* to

all kinds of training. I am not prejudiced against them; merely, I wish to assign them a proper place in athletics. Heavy gymnastics, in which the arms handle the weight of the body, and heavy dumb-bell lifting, while they develop the muscles, would tend to make them somewhat "slow," were it not for light exercises which should always be taken after heavy work. Boxing and hand-ball are among the best of "quick" exercises. (In Chapter X, I have given the more important light exercises in detail. They give elasticity to the muscles, by stretching them; and they keep the joints supple.)

For ten years I have studied the physical development of individuals and of classes of individuals. I find that observation and experience bear out in every particular the simple theories which I have tried to make plain. Strong men, who make their living by performing feats of strength, are more magnificently developed than any class of men in the world. Gymnasts who handle their own weight are always muscular. The "under"

man in a tumbling trio is very strong and often very agile. In business life,—porters, truck-drivers and furniture movers are, as a rule, splendid specimens of physical development. In short, most men who do straining work are well-developed and strong, and also enjoy robust health. In marked contrast to these brawny men are clerks and men of sedentary occupations.

II

STRENGTH AND TRAINING OF PUGILISTS

A WORD about pugilists. Most persons know in a general way from reading the newspapers how this interesting class of the community trains. Nearly all of them abhor heavy work, and I believe that none of them uses large dumb-bells. Light dumb-bells, punching the air-bag, hand-ball, running, walking, and, of course, boxing, form the basis of their training. That kind of exercise makes them quick and agile; it also gives them endurance and "wind." But are pugilists, as a class, very strong? I can unhesitatingly answer this question in the negative. Compare the muscular development of a group of prize-fighters with that of a group of wrestlers or weight-lifters. There have been pugilists, however, who have had great natural strength —John L. Sullivan, for example; but the great John L., before he went into prize fighting, was

a weight-lifter; at any rate, he performed feats of strength. And this man, who possessed more strength than science, was the greatest fighter of his time. I insist, simply, that the ordinary training itself which a prize-fighter undergoes in preparing for a contest, while it does give him agility and endurance, does *not* develop his muscles much. It builds him up less than it makes the best of what he already has.

Six weeks is, usually, all the time necessary for a pugilist to get into perfect condition. But why cannot cultivated muscles be brought as quickly into good condition as so-called natural muscles? I see nothing to prevent them from becoming equally as quick and elastic. As a matter of fact, cultivated or developed muscles, owing to their high sensitiveness, respond most promptly to nervous stimuli. If pugilists would cultivate their strength while "laying off," and pursue their ordinary regimen of training when matched, they would find that their more powerful muscles could "put up" a much better fight.

Although pugilists may not believe it, *former* heavy work has contributed largely to the success of many of them. Robert Fitzsimmons, the Grand Old Man of the ring, was once a blacksmith—an arduous occupation. Jeffries, the present champion, was a boiler maker. Munroe, who attained fame by knocking Jeffries down, was a miner. On the other hand, "Gentleman Jim" Corbett was a bank clerk. He was a remarkably clever boxer. When he knocked out John L. Sullivan, many declared that Sullivan had already been knocked out by something stronger than Jim. Be that as it may, Corbett was speedily deposed by Fitzsimmons. He never regained the championship, *because he lacked hitting-power.*

The experience of William Maclellan, at one time champion middle-weight, is interesting and to the point. For many years "Mac" was the boxing instructor in Wood's gymnasium in the city of New York. One summer a number of men met there, afternoons, to "put up," single arm, big dumb-bells. The class was large, and the weakest man in it could

push a hundred pounds. As business was dull with Mac that season, the boys easily persuaded him to join the class. The boxer worked steadily with the weights; finally learning to put up one hundred and forty pounds. But when Mac started to box again, he found that the heavy work had made him "slow." He was alarmed, "swore off" heavy weights, and resumed boxing; with the result that in *one* week he recovered all his old-time elasticity, and, within a short time, as he declared to me himself, his trained muscles, which had trebled in strength, became quicker than they had ever been. He afterwards became the champion middle-weight of the world.

The anecdote teaches that slow, heavy work *alone* tends to make the muscles somewhat slow, *temporarily;* a few weeks of quick exercises bringing back their former quickness. There is no doubt that if a man wishes to be quick as well as strong, he must combine light with heavy work.

It cannot be insisted upon too strongly, that muscles can do only what they are accustomed

to doing. They cannot act quickly, if they have not been trained to act quickly, any more than they can bear great strain and make powerful contractions, when they have been taught to bear only slight strain and to make feeble contractions. I concede that slight strain borne for a long time will tire out the muscles; but I do not concede that slight strain will develop them. Suppose that some great statesman, whose brain was accustomed to wrestling with the most intricate problems, were to add up long columns of figures; his brain would become tired. But would this exercise, which required an inferior effort on the part of a superior organ, develop that organ or even keep it in good condition? As with the brain, so with the muscles. Of course, the amount of blood which flows to a muscle undergoing slight strain is slightly increased; but it has been determined by experiment that when the same muscle is subjected to a *great* strain the influx of blood is much more prolonged and very much increased.

All men wish health; some men covet great

strength; but most men desire health with a fair amount of strength. It is not necessary that every man should become as strong as it is possible for him to be; yet I hope that all who are interested in physical culture will be able to derive some benefit from the system of training which I suggest from experience.

III

CHEST-WEIGHT AND PARALLEL-BAR EXERCISES—"CHINNING" ONE'S SELF WITH ONE HAND—THE FRONT HORIZONTAL

IN this chapter and in Chapter V, I shall outline as briefly as possible a practical system of progressive physical culture. This system is guided by the principle that muscles can do only what they have been trained to do; or, that they can bear heavy strain *safely* only after they have been gradually trained to bear it. To expect muscles that have never performed movements requiring strength, to be strong, is both unphysiological and illogical.

Heavy work cannot be done unless one is strong; by progressive physical culture any sound person can learn to do heavy work; therefore, by progressive physical culture any sound person can become strong.

Here I would state that special exercises, for persons not physically sound—those with

heart disease, lung trouble, etc.—do not come within the province of this book. Such persons should exercise only under the advice of their physicians. Mere delicateness, however, is not unsoundness; a man or a woman may be extremely delicate, yet perfectly sound.

When a weak muscle is forced to contract repeatedly with almost its full force, it gains strength with extraordinary rapidity. This statement is not a theory, but a practical experience; for, when I myself have been out of condition, and have worked with weights heavy enough to necessitate strenuous exertion, I have noticed an improvement so rapid as to be plainly perceptible from day to day.

The belief that light weights will make a man stronger than will heavy weights has done an incalculable amount of harm in retarding the magnificent possibilities of scientific physical culture. The majority of men condemn heavy weights and extol light weights, simply because leading physical culturists do. Ask any layman why he does this, and he will invariably answer, " They say so." Insist upon knowing

why, and he will either change the subject or walk away. It is strange that men are not more impressed with these two facts: First, that in their own observations, they never saw a man who did heavy work that was not strong; second, that they never saw a man who did light work *exclusively,* that *was* strong. They may have *heard* of such men, but they never *saw* them.

Every man, at some period of his life, becomes interested in physical culture. He then reads up on the subject, and finds that to become strong he should use light weights. He does this, and, after some time, seeing no result, becomes discouraged. But he does not presume to blame the system that has been declared the best by the highest authorities; he concludes that the fault lies in himself. Yet how absurd for him to think himself physiologically different from his fellows! If light weights have made one man strong, they will make all men strong.

When the muscles are very soft it is best to begin with a course on the chest-weights. The

following are excellent movements; in all which, the arms are moved simultaneously.

Face the chest-weights, and, after grasping a handle firmly with each hand, hold the arms straight out in front of the chest. Stand with the heels nearly together, and far enough away from the weights to raise them a little from the floor.

First Movement. Draw the two handles to the chest and almost under the armpits, letting the elbows and shoulders go well back; then extend the arms again. Repeat twenty-five times.

Second Movement. Start as before, with arms extended straight out in front, palms down. Now, keeping the arms straight, bring them down and a little past the sides; then let them go back to their former position, and, keeping them as straight as possible, throw them well back above the head. Repeat this double motion twenty-five times.

Third Movement. Hold arms straight out in front; then, keeping them straight and always horizontal with the floor, open them wide and

throw them as far back as possible. Repeat twenty-five times.

Fourth Movement. Stand with the legs slightly apart and the *back* to the chest-weights. Grasp a handle with each hand, hold the chest out, bend the arms, keeping the elbows and shoulders well back. The hands should be even with the pectoral muscles; the ropes outside of the arms. Now thrust the arms straight out in front; then let them go back to their former position. Repeat twenty-five times.

Fifth Movement. Stand with the back to the chest-weights, palms forward, arms straight. Let the arms go past the sides, back and up as far as possible; then bring them down and forward; describe circle, and, bending the arms slightly, let the handles go well back over the tops of the shoulders, palms up. Now bring them forward again, and, describing circle, let them go down, past the sides, back and up again. Repeat this double motion twenty-five times.

Sixth Movement. Stand with the back to

the chest-weights, holding the arms straight out in front; then, keeping them straight and horizontal with the floor, open them wide and let them go back as far as possible. Now, still holding them horizontal with the floor, bring them forward again until the hands meet in front. This is a splendid exercise to expand and develop the chest. Repeat twenty-five times.

Seventh Movement. In performing this movement the arms and legs must be kept perfectly straight and the heels together. It is more of a body than an arm exercise. Face the chest-weights, and, after grasping the handles, bend the body forward from the waist, and, if possible, far enough down to touch the knuckles to the floor; then come up again, bend backwards, and, still keeping the arms straight, throw them back over the head. Repeat this double motion twenty-five times.

Repeat each of the above movements twenty-five times—no more. An ability to repeat more than that number of times shows that the

weights are too light; so, as your strength increases, add more iron plates. Perform smoothly, with an easy, swinging motion.

When you will have progressed sufficiently to be able to pull reasonably heavy weights with comparative ease, you are fairly developed above the waist; while your muscles are hard and in good condition. After these exercises with the chest-weights, run a little, on the balls of the feet. Stop when tired, but try to increase your speed, stride, and the distance, from week to week.

The following exercise with a pair of fairly light dumb-bells is excellent for a beginner. It strengthens the legs, back, abdomen, shoulders and arms. Place side by side two fifteen- or twenty-pound dumb-bells. Stand over them with the legs slightly apart. Now flex the legs, bend over, and, after grasping the bells, toss them to the shoulders by straightening the back and legs simultaneously; then bend the body slightly backward, throw the head back, and, keeping the eyes on the bells, push them up to straight arm above the shoulders; then

Plate I. BENT-ARM POSITION.

immediately lower them to the shoulders, and thence to the floor. Repeat this double motion from ten to fifteen times, performing it briskly. As with the chest-weight exercises, an ability to repeat this movement more than, say fifteen times, proves that the weights are too light; in which case take larger dumb-bells.

Here is an excellent abdominal exercise. Sit on an ordinary stool, and place the toes under some object heavy enough to hold them firmly. Now, letting the arms remain at the sides, bend slowly backward from the hips until the head touches the floor; then bring the body up again to its sitting position. Repeat about twenty times. The difficulty of this exercise may be increased,—by performing it with the arms folded,—with the hands clasped behind the head,—or by holding a dumb-bell to the back of the neck.

Before attempting on the parallel bars the regular exercises which I shall describe, it is necessary to accustom the muscles above the waist to the weight of the body. First learn freely to swing the body, suspended between the

arms, and to keep the balance. To learn this, jump up on the bars to "straight arm"; then, holding the arms and legs straight, swing the body and legs slightly forward and back; but swing somewhat higher each day, until you are able to keep your balance while swinging freely. Afterwards learn a "still dip"—a dip without a swing—thus: Jump up on the bars to straight arm; then lower the suspended body gradually, by bending the arms until the front part of the shoulders comes down almost to the hands; from this position try to push up to straight arm again. See Plate I.

The next exercise is, to swing "bent arm." Lower the body from straight arm, as described in the still dip, and swing gently forward and back while in that position. Practice this exercise until you can swing moderately high without feeling strained. Take care not to let the body sag between the bars, and hold the elbows in.

Within a few weeks or months—depending upon your weight and condition, you ought to be strong enough to try a "forward dip." It

Plate II. DOWN IN A FRONT DIP.

Plate III. UP IN A FRONT DIP.

is performed thus: Swing straight arm, but dip when the legs are behind and just at the end of the back swing; then, as the legs come up on the forward swing, push up to straight arm again. Practice until you can do this fifteen or twenty times in succession. See Plates II and III.

To perform a "back dip," swing straight arm and dip when the legs are at the end of the *front* swing; then, as the legs come up on the back swing, push up to straight arm again. See Plates IV and V. This is slightly harder than the front dip. In performing these exercises, be careful not to overdo; otherwise, the muscles will become very sore. (See general rules for exercise, page 111).

After you have mastered these different dips, you may try some, if not all, of the twelve motions about to be detailed.

First, a correct position of the body is essential. Jump up on the bars to straight arm, and allow the body to hang naturally and easily. The head should be up, chin in, chest out, shoulders back, legs straight, feet together,

and toes pointed. See Plate VI. When not bent to perform a dipping movement, the arms should be perfectly straight; the thumbs should be on the inner sides of the bars. For the sake of brevity, I shall sometimes use the word "straight" for straight arm, and "bent" for bent arm.

No. 1. The "Walk." Assume correct position. Walk forward to end of bars, and then back, by moving the arms alternately.

No. 2. The "Jiggle." Same position. Go forward, then back, by making short quick jumps, moving both arms at once. This movement is performed entirely by play of the hands and wrists; the body and legs maintaining the correct position *throughout the movement.* The jumps should be not more than four inches long.

No. 3. The "Cinch." Assume position; then swing moderately high, and, each time the legs and body swing forward, jump forward, until you reach the far end of the bars. To come back, jump backward, each time the legs and body swing backward. In brief, this

Plate IV. DOWN IN A BACK DIP.

Plate V. UP IN A BACK DIP.

motion is from "straight" to "straight" *with the swing,* forward; and from "straight" to "straight" *with the swing,* back.

No. 4. The "Pons Asinorum." Swing straight arm as before; then jump from straight to straight *against the swing,* going forward, and from straight to straight *against the swing,* coming back; that is, to go forward, you must jump forward each time the legs reach the *highest point* on the back swing, while, to come back, you must jump backward as the legs swing forward. This is a rather difficult movement, at first, especially coming back. In coming back, the jumps should be made when the legs have swung only *half-way forward,* and, as you jump, let the legs go up, so that when you alight the legs will be in front; otherwise, you will lose the swing.

No. 5. The "Chick-Chick." Assume position. Now, without a swing, jump forward to bent; then, taking advantage of the rebound, jump forward to straight. To come back, jump from straight to bent, and from bent to straight, backwards. In other words, jump

down, and then jump up, progressing on each jump. Take care, while performing this movement, not to swing, and not to lose the time.

No. 6. The "Grasshopper." Jump from bent to bent, without a swing, forward; and from bent to bent, without a swing, back. In none of these bent-arm movements allow the body to sag between the bars; and keep the elbows in.

No. 7. The "Beauty." Swing bent arm, and jump from bent to bent *with the swing,* forward; and from bent to bent *with the swing,* back.

No. 8. The "Beast." Swing bent arm, and jump from bent to bent *against the swing,* forward; and from bent to bent *against the swing,* back. In coming back, jump when the legs are *half-way* on the forward swing, letting the legs go up, so as to alight with the legs in front.

No. 9. The "Tenderfoot." Jump from bent to straight *with the swing,* forward; and from straight to bent *with the swing,* back: or,

Plate VI. STRAIGHT-ARM POSITION ON PARALLEL BARS.

more minutely, to go forward, dip when the legs are behind, and, as they swing forward, jump forward to straight arm; to come back, swing straight arm, and, as the legs swing back, jump back to bent arm, then push up to straight arm, as the legs come forward, and again jump, as the legs swing back, to bent arm.

No. 10. The "Hellion." Swing straight arm, dip when the legs are in front, and jump forward to straight arm as the legs swing back. To come back, swing straight arm, dip when the legs are in front, and, as they swing back, jump back to straight arm. Briefly, this movement is from bent to straight *against the swing,* forward; and from bent to straight *with the swing, back.* It is difficult, requiring an extremely powerful push to jump forward from bent to straight *against* the swing. If you succeed at first in going forward a short distance, you will do well.

No. 11. The "Baby." Swing straight arm, and jump from straight to bent *with the swing,* forward; and from straight to bent

against the swing, back. After alighting bent arm, you must, of course, push up to straight arm before making the next jump.

No. 12. The "Devil's Own." Swing straight arm, and jump from straight to bent *against the swing,* forward; and from bent to straight *against the swing,* back. Going forward, alight bent arm, with the legs *behind;* coming back, dip when the legs are behind, and jump back to straight arm as the legs swing forward, alighting with the legs in *front.*

In performing any of these swinging motions it is absolutely necessary that the legs should be in the proper position *after* you have made the jump. If you do not pay attention to this detail, the jump will check the swing. In jumping forward *with* the swing, and backward *against* the swing, you should alight with the legs in *front;* in jumping forward *against* the swing, and backward *with* the swing, you should alight with the legs *behind.* It ought never to be necessary to take an extra swing.

I have given these twelve motions in detail, because they are very important; and I can

Plate VII. A FRONT HORIZONTAL HELD A TRIFLE "HIGH."

confidently assert from experience that if a man, by perserving practice, learns to do them well and goes through them faithfully three times a week, he will, within a short time, magnificently and evenly develop *all* the muscles above his waist, particularly those of his chest, shoulders, arms and abdomen. I know of no other single exercise that will do this in a like degree. It is true that the strain is very great; but if the training be *gradual,* the muscles will at last become large and powerful enough to bear this strain as easily as a man's legs bear the strain of running or jumping.

A word more in regard to this vigorous and active exercise—it should be progressive; that is, after a man has learned to perform all the motions well, he should try on each exercising day to make longer jumps. Of course, the longer the jumps, the more powerful must be the contractions of the muscles, and, therefore, the greater will be their development. To give my readers some idea of what one can do with practice, I state in the succeeding paragraph the distances which I myself have made in ten

of the movements; the length of the bars being a trifle over sixteen feet.

No. 5,—in two jumps forward and in two back, counting down and up as one jump. Nos. 3, 4, 6, 7, 8, 9, 10, 11, and 12,—each, in three forward and in three back.

A curious fact appears from these figures—the remarkable uniformity in the lengths of the jumps, whether with the swing or against it, whether forward or backward. This demonstrates in a striking way just what I have vigorously contended—the wonderful adaptability of the muscles to the work required of them. If, ordinarily, we can jump farther forward than backward, it is solely because we, as a rule, practice the former more sedulously than the latter.

As another argument in favor of a *progressive* system of culture, it is worth while to add that, because no other member of the bar-class, which consisted of about ten men, strove on each exercising day to jump *a little farther,* none was able even to approximate the distances which I made, who did so strive. While

their mode of performance made them strong enough to go through the movements, it did not make them strong enough to withstand the strain incident to long jumps. Lastly, the fact that, after years of practice, I was finally able to clear fifteen feet—nearly the length of the bars—in *two* "grasshopper" jumps, without a swing, either forward or backward, seems to me a refutation of the popular notion that the arms are ill-adapted for the support and handling of the weight of the body; for 7.5 feet is almost as far as the average man can jump on his legs.

"Chinning" one's self with one hand is a difficult feat of strength. You may learn it in this way. First practice chinning yourself with two hands, until you learn to repeat about twenty times. Then, for a month or two, practice climbing a rope, or a pole, hand over hand without using the legs; this will accustom each arm to support alternately, while bent, the entire weight of the body. Also, "chin" yourself on a single ring, or on a horizontal bar, with two hands; then, letting go with one hand, try

to lower yourself very slowly with the other. After considerable of this preliminary training, practice the feat itself.

The "front horizontal" is another hard feat; the strain being very severe on the abdomen. It can be learned, however, rather easily by a man who has been exercising up to the present point according to this system. In holding a perfect horizontal, the hands grasp the bar in a natural position; the arms are straight; the head is thrown back, chin in. From head to feet the body is held rigid beneath the bar, and perfectly horizontal with the floor. The arms are not at right angles with the body, but incline forward. To learn the front horizontal, try, at first, to hold it with one knee bent, and the foot placed on the other knee; then, as you become stronger, straighten the bent knee more and more, until you are able to hold the horizontal with both legs straight. Probably you will notice that when you straighten both legs, you will sag somewhat at the waist. But this sag will gradually disappear as the muscles increase in power. See Plate VI.

IV

HOW TO STAND AND WALK ON THE HANDS

ALL boys, and men who are in the least degree athletic, try to learn how to stand on their hands. In any gymnasium one may see all ages and sizes of the sex striving to accomplish this feat. A few succeed; many do not. Yet it is simple—when you know how. Some sprawl their hands out, with arms widespread, and buck like refractory bronchos. No one, however, can learn the trick, unless he first "throws up" into the proper position, and then works in the *correct* way for the balance. I have known men that have practiced the hand-stand for years, and not learned it; simply because they did not work their arms and hands properly, after they had gained the position. They would sometimes balance, as a stick does, for an instant; then fall down as soon as the body swayed the least bit out of its center of gravity. Now

there are simple ways of checking either forward or backward swaying (which always occurs with beginners); and when these are learned, the hand-balance is easy of accomplishment.

Place the hands, extended straight out in front, flat on the floor, and as far apart as the shoulders. The fingers should be slightly spread. Now hold the head back, keep the chest pretty well forward, and, springing from the right foot, throw the legs up over the head, at the same time hollowing the back. The throw should be just hard enough to get the inverted body on a balance. This is the first step. The next is to stay on the balance when you get there. This is not so easy. Once on a balance you will find that your legs will sway either forward or backward. Check these movements thus: When the legs sway forward, *sink* with the arms; this will throw the legs backward; if they go too far backward, that is, too far over the head, straighten the arms, push back, and press strongly with the fingers.

Plate VIII. STANDING POSITION.

At first you will find that the legs do not seem to go backward when you sink with the arms; this is because you do not sink soon enough. Persevere for only a few days along these lines, and you will at last "feel" the balance; then, a little more practice, and you will wonder why others find a hand-stand so difficult. See Plate IX.

While learning the hand-balance you need not be over particular about keeping the knees straight, and the feet together. After you have learned it, do both these things.

One more point. Sometimes it will happen that the legs will go so far backward that, press and push back as you will, you cannot "recover." In that case allow the legs to go over, lift up the right hand, and, letting the weight rest on the left hand, make a half turn to the left, and drop to the feet.

To walk on the hands, throw up into a "stand," then overbalance slightly by letting the legs go well back over the head, swing the weight on to the left arm, lift up and advance the right arm a step; now swing the weight on

to the right arm, overbalance, lift up and advance the left arm a step. After you have learned to take three or four steps in that way, you will soon learn to take twenty or more. In order to walk steadily, you must keep constantly overbalanced. Master the "stand," before you try to walk.

Plate IX. A HAND-STAND.

V

HEAVY DUMB-BELL LIFTING, AND ITS RESULTS—FEATS OF STRENGTH

HEAVY-WEIGHT lifting develops great strength in the loins, back, abdomen, shoulders, arms and legs. But it is unquestionably dangerous for an untrained man to attempt to lift very heavy weights. What may be called toleration of strain is acquired *gradually;* so, the weights handled by a novice should be, at first, comparatively light, then medium, and slowly grade to heavy.* In dumb-bell, as in other exercises, progression should be the fundamental principle.

To illustrate the limitations of muscles which have not been trained by a progressive system, let us take the case of a day laborer who can

* Adjustable dumb-bells of different kinds may be procured of sporting goods dealers, the weight of which may be increased or decreased as desired by various devices.

shovel dirt, or handle a pickax, all the day long without considerable fatigue. Clearly, his muscles are hard and enduring; but that they do not compare in *power* with those of a man who has practiced progressive dumb-bell lifting, will be proved if you put the maximum contractile power of the laborer's muscles to the test by giving him a pair of, say eighty-five-pound dumb-bells, to raise to his shoulders and to push to straight arm above his head. Assuredly he will fail to accomplish the feat, not only because, as some persons think, he has not the knack, but because he has not the requisite strength. If he succeeds in tossing the weights to his shoulders,—which is extremely doubtful,—no amount of skill will enable him to push them above his head; they can be raised only by his muscles contracting with great force. But why cannot his muscles make such contractions?—they have been accustomed to hard work daily. True; but they have not been accustomed to extremely heavy work. A shovelful of dirt, however often lifted, is light compared with a weight of

Plate X. READY FOR A DOUBLE-CURL.

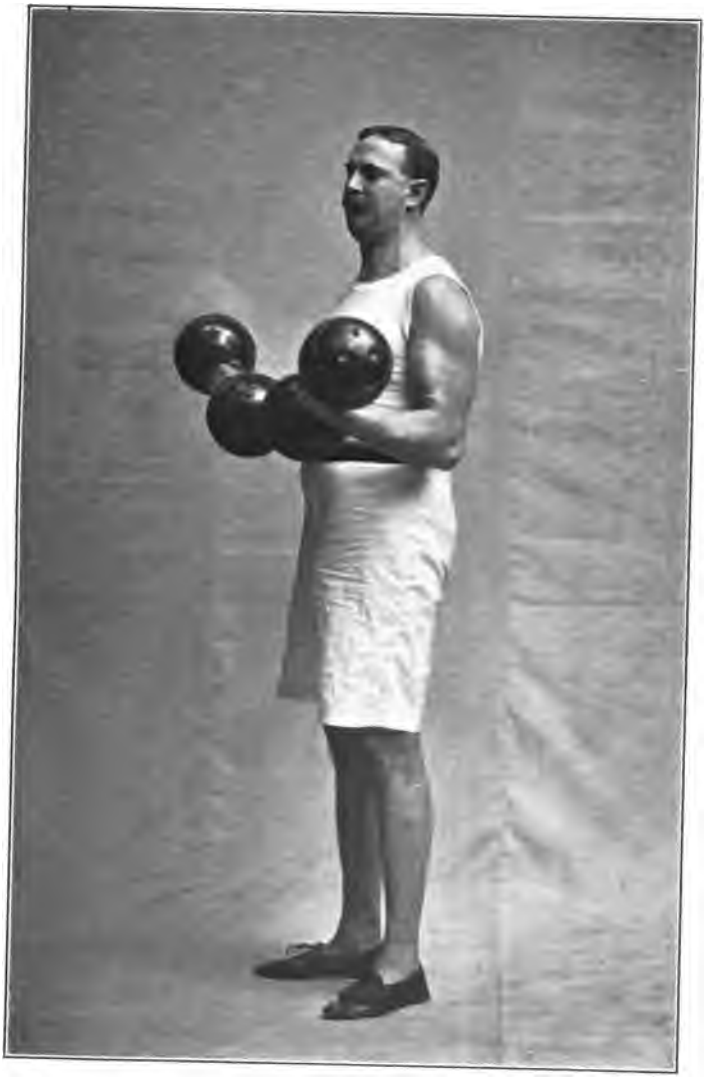

Plate XI. HALF-WAY ON CURL.

one hundred and seventy pounds; and it is to the strain of the former weight only that the laborer has become habituated.

"Curling" heavy dumb-bells develops the wrist, forearm, upper arm, and back. Before starting to curl two dumb-bells, stand with the legs straight, and the body inclined slightly forward; the arms should hang free of the body, and straight down: now turn the palms upward, and curl the bells to the shoulders by at once curling up the wrists, flexing the arms and slowly straightening the back. See Plates X and XI. Some curl with the elbows resting on the groins. No swing should accompany a curling movement.

To put the bells up after you have them at the shoulders, throw the chest out, lean back, and, keeping the eyes on the bells, push them to straight arm above the head. Be careful not to bend the knees. The feet should be even, heels about eighteen inches apart, and toes slightly out-turned. See Plates XII, XIII, and XIV.

If you would now learn to curl and to push

two really heavy weights, simultaneously, begin with dumb-bells that are not too heavy—with a pair of forties or forty-fives. Curl and push these in the way described. Rest a few minutes; then curl and push them again. Continue, thus alternately resting and working, for about fifteen minutes. When you are at last able to put them up easily and well, repeat a few times; that is, put them up several times in succession. Next try a pair of fifty-pound weights; which work with in the same way. After the fifties have become easy, try fifty-fives; then two sixties, and so on; but never attempt weights much heavier than those you have just learned to handle: it is better to coax muscles than to overdrive them.

It will sometimes happen that on the first day you try weights heavier than those you have been accustomed to, you will not be able to put them up *all the way;* but, by no means, let this discourage you. Attempt the feat carefully several times, pushing the bells as high as you can, without *over*straining, and after a few days you will find that your muscles will have

Plate XII. NOW FOR A DOUBLE-PUSH.

Plate XIII. HALF-WAY ON PUSH.

become accustomed to the slight additional strain, and you will put up the new weights as easily as you did the old. (See general rules for exercise, page 111).

There is a limit to the acquirement of strength; but this limit varies much, depending chiefly upon the weight and general physique of the individual. I can say from experience that if a man works properly, he will improve steadily for many years. To put up two sixty-fives, *fairly,* is considered very good; and most men can learn to do this if they will work in the right way. A few might learn to push two eighty-fives. I once saw two one-hundreds put up fairly, three times in succession, by a giant weighing two hundred and eighty-five pounds. Curiously enough, this man who, obviously, had enormous strength in his triceps, was comparatively weak in his biceps, for he was unable even to swing these weights to his shoulders; two men had to lift them to those points before he could push them.

In the practice of progressive double-weight pushing, I have found it not expedient to repeat

with bells that I could put up more than five successive times; and the best results have come from making many separate maximum efforts with bells that were nearly quite as large as I could handle. On the other hand, working with weights that were entirely beyond my strength, if not positively harmful, was at least useless. Repeating with fair-sized weights seems not to help one to any great degree in putting up *heavy* weights, probably because of there being too wide a difference in the force of the respective contractions. *It is best to work hard only every other day;* the days between give the muscles a chance to rest and to grow. (See pages 31 and 32.)

At one time, in my own training, I worked at home with only three pairs of dumb-bells; the lightest weighing fifty-five pounds each; the next, seventy pounds each; and the heaviest, seventy-five pounds each. I used these weights, three times a week, for from one-half, to three-quarters, of an hour. I began by curling and pushing the two fifty-fives three times; then I did the same, five times, with the

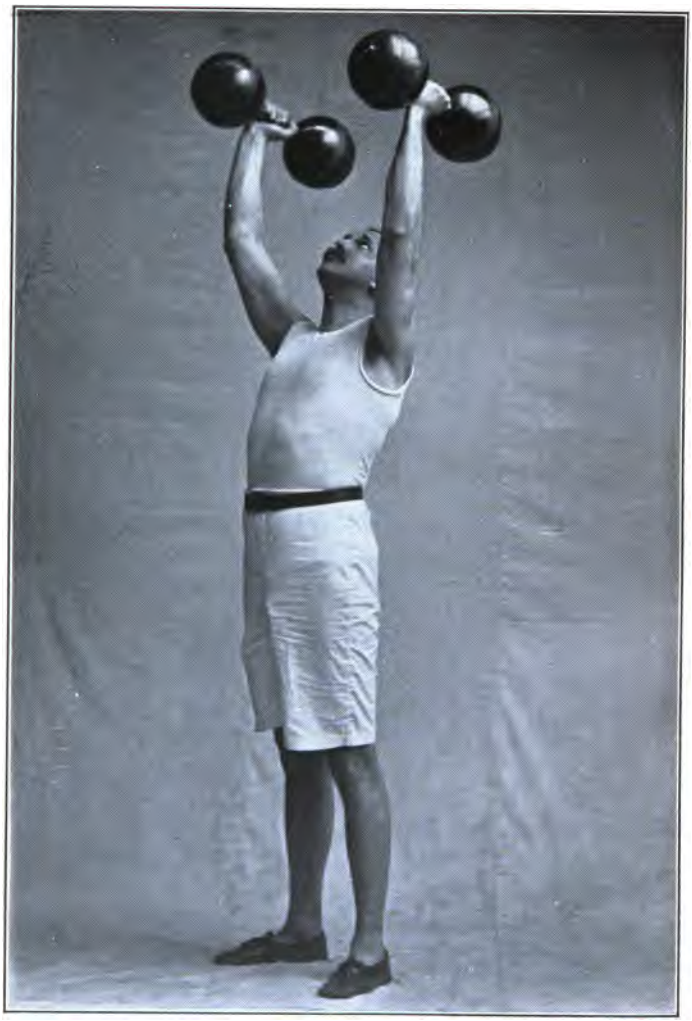

Plate XIV. DUMB-BELLS UP.

two seventies; so with the two seventy-fives, five or six times. All were separate "lifts," not "repeats." Afterwards I repeated with the two seventies four or five times; and, when I felt specially strong, I also repeated several times with the two seventy-fives. My last exercise was at punching a heavy canvas bag.

The above system, simple as it was, convenient, and occupying but little time, was effective; for by it I not only kept in excellent physical condition, but steadily gained strength. Two experiments which I made at that time are worth recording.

For several months I stopped using the seventies and the seventy-fives, but worked hard with the fifty-fives, with which I practiced repeats. The result was that I became unable to handle either the seventies or the seventy-fives, and even the fifty-fives grew to feel heavier than formerly. My strength gradually returned on resuming my old system.

For my second experiment I selected a man of ordinary strength, showed him how to put up two forties, and requested him to practice

repeats with those bells daily, for an indefinite time. He agreed, and for some months practiced assiduously. He improved rapidly, at first; then more slowly, until, finally, he reached a limit in repeats, beyond which, try as he would, he could not go. "I'm as strong as I can be," he said one day; "I can't do better." I answered: "Your muscles have increased in strength sufficiently to enable you to put up two forty-pound weights easily; moreover, you have trained them to resist, for a certain length of time, the fatigue caused by their repeated contractions: but they are not as strong as they can be." To prove my last statement, I then gave him two forty-fives, and told him to work with those in the same way that he had worked with the others. Which he did; and, after a few weeks, to his great astonishment, he succeeded in putting up the forty-fives as many successive times as he had before put up the forties. The experiment was not continued further.

If another proof that heavy weights make one stronger than do lighter weights, be needed, the above experiments furnish it, by demon-

Plate XV. ONE POSITION IN SEE-SAW.

Plate XVI. ANOTHER POSITION IN SEE-SAW.

strating that, even though one repeat with lighter weights as often as may be, the muscles acquire little more strength than that necessary to overcome a given resistance. Further, the second experiment shows that if one subjects the muscles to the strain of a weight heavier than they have been accustomed to bear, and keeps them under that strain as long as possible, day after day, he will not only increase the muscles' strength, but will eventually train them to resist the profounder effects of their stronger contractions equally as long as they once resisted the less effects of their weaker contractions. Of course, the potential, though not actual, ability of muscles to repeat an equal number of times with medium, or with slightly heavier weights, would not exist beyond a certain limit.

Both experiments illustrate a cardinal principle in physical culture, which principle would appear to be not generally known—that it is the *force* of contractions, and not their frequency, that is *the* important factor in the development of strength.

The theory that light weights will better develop a man than will heavy weights, is attractive chiefly in that it implies but little labor. The implication, however, is illusory; for, in order to produce even slight results, light exercise must be continued for a long time, which. besides demanding much leisure, makes the work as monotonous as it is unsatisfactory. On the other hand, heavy work, while it does imply great effort of the will as well as of the muscles, exacts but one hour and a half per week,—a half-hour each exercising day,—and it never becomes monotonous, because ambition is kindled and the pride constantly gratified by achievements that augment rapidly. One sees results, accomplishes real feats, and feels that what he is doing is worth while.

Before adverting to single-weight pushing, I must describe yet another movement with double-weights. Toss two bells equal in weight to the shoulders. Throw the head back, and chest out, and push the right bell up to straight arm above shoulder; then lower

Plate XVII. READY FOR A SINGLE-PUSH.

Plate XVIII. HALF-WAY.

it steadily, and, *as it descends,* push the left bell up to straight arm above shoulder; now lower the left arm, and, *as it descends,* again push up the right bell. In that way repeat the alternate movements five or six times with each arm. See Plates XV and XVI.

While performing this exercise the body should sway evenly and rhythmically away from the bell which is being pushed; and the bells should move alternately up and down, smoothly and without perceptible pause. Do not push one bell, lower it, and then push the other; and let them at no time "spread" farther than the width of the shoulders.

The above movement, when performed correctly, is not only graceful; it is splendid exercise for the shoulders, loins, and sides. By gradually increasing the weights, you may learn to "see-saw" two fifties, or, perhaps, even two sixty-fives, very nicely.

Now for the *single-weight* push. A big dumb-bell is put up scientifically, thus: The athlete swings the weight up to his right shoulder with two hands; he then lets go with

the left hand, holds the weight close in to his shoulder with the right, and stands squarely with both legs straight; he now puts up the bell by bending his body toward the left, partly forward, and down, at the same time gradually opening his arm so as to keep his forearm constantly perpendicular with the floor; he also lets his arm go back as far as his body comes forward, and bends his *left* knee; in that manner he "gets away" from the bell until his right arm is straight; when he slowly stands up, holding the bell at straight arm above his shoulder.

From this description it will be noticed that the weight is supported and carefully balanced, rather than pushed; the right upper arm being kept pressed against the big muscle just under the back part of the shoulder, until the bell is almost entirely "up." Plates XVII-XX illustrate a *left*-hand push.

The record for single-weight pushing was held for a long time by Richard Pennell, who put up, in the scientific manner above described, a 201-pound dumb-bell. Recently, "strong-

Plate XIX. STRAIGHT ARM ABOVE SHOULDER.

Plate XX. DUMB-BELL UP.

men" have been credited with having pushed three hundred pounds. In the old days, however, records were made with ordinary short-handled dumb-bells; now bar-bells, with handles from three to four feet long, are used. For a two-hand bar-bell push, see Plates XXI and XXII. I myself witnessed a short stockily-built "strong-man," who weighed but 168 pounds, put up with one hand a short-handled dumb-bell weighing 237 pounds. Immediately after the feat the bell was weighed in my presence on a Fairbanks scale. But this athlete was not able to push two one-hundreds.

The developmental *effects* of a progressive physical culture system are truly astonishing. At a gymnasium which I attended, I trained a boy according to the general principles that I have tried to make plain. He was sixteen years old and of ordinary build. Within a year he was transformed; the parallel bars and rope-climbing having developed him splendidly. He learned to curl and to put up, simultaneously, a 65-pound weight in each

hand; and, before he was eighteen, he pushed, single arm, a 120-pound dumb-bell.

Shortly afterward I trained a second boy of about the same age, who was rather delicate in appearance and by no means naturally strong. In six months he gained sixteen pounds in weight. This boy as well, learned to put up two sixty-fives; and, in the second year of his training, he too pushed the 120-pound bell. Moreover, he learned to hold a perfect front horizontal below the bar, and to chin himself with one hand.

As for my own strength, I know it to be almost entirely the result of scientific training. I was a slightly-built, delicate boy. At school I used to pull chest-weights, with other boys; I could do a few dips on the parallel bars, and I could climb the under part of an inclined ladder hand over hand. One day I tried to see how much I could put up; and from that time heavy weights and feats of strength have had a peculiar fascination for me. I worked systematically, and in my own way, although I was warned frequently by different ones that,

Plate XXI. TWO HAND BAR-BELL PUSH.—HALF WAY.

Plate XXII. TWO HAND BAR-BELL PUSH.—UP.

being tall and slender, I was not built for heavy weights, and would surely strain myself if I used them. Moreover, all insisted that light weights would make me a great deal stronger.

The following extracts from a record-book which I kept at that time show the practical results of my system upon myself. The dates tell how rapid was the increase in strength.

Single-weight pushing, May 10th, 1888.—Height, 5 ft., 11¼ in. (in stockings); weight, 134½ pounds (stripped); age, 17 years. Pushed 100-pound dumb-bell, right arm. All the pushes given in these extracts were slow pushes from the shoulder to straight arm above shoulder. The dumb-bells were all short-handled. Nov. 24th, 1888.—Height, 5 ft., 11½ in.; weight, 137½ pounds. Pushed 121¾ pound dumb-bell, right arm. May 2d, 1889. —Pushed 121¾-pound dumb-bell, left arm. Nov. 12th, 1889.—Height, 6 ft.; weight, 147 pounds. Pushed 142¾-pound dumb-bell with the right arm; then pushed the same weight

with the left arm. One week later, pushed 150-pound dumb-bell, right arm. Also, swung the 120-pound bell from the floor to the shoulder with the right arm alone, and pushed it; then did the same with the left arm. Afterwards, pushed an 85-pound dumb-bell eighteen times in succession, right arm.

Double-weight pushing. June 5th, 1889.—Weight, 140 pounds. Pushed two 75-pound dumb-bells simultaneously: slow push; did not "jump" them, nor sink with the legs. Sept., 1890.—Pushed two 75-pound bells four times in succession; and two 65-pound bells, eight times in succession: all were fair pushes.

"Curling," Jan. 17th, 1890.—Weight, 150 pounds. Curled with right arm, and then with left arm, an 85-pound bell. Jan., 1890. —Curled two 75-pound bells simultaneously, twice in succession. All curls were performed without a swing, and were started from straight arm.

Miscellaneous.—April 7th, 1890.—Weight, 150 pounds. Pulled up to the chin, with left arm alone, three times in succession, starting

each time from a "dead hang." Then, after a rest, with the same arm pulled up to the chin, from a dead hang, while holding a 10-pound weight in the right hand. Pulled up to the chin with the right arm alone, twice in succession. March 11th, 1889.—Held a back, and then a perfectly straight front, horizontal below the bar. Nov. 11th, 1890.—Held a horizontal *above* the bar; that is, keeping the arms straight, lowered the body and legs down from a hand-stand until they were horizontal with the floor, and stayed in that position. Nov., 1889.—Pushed with the legs alone 1315 pounds. This record was made on a leg-testing machine used in examining men for the police force. Nov., 1890.—Performed a "still dip" on the parallel bars, while holding 140 pounds on the legs. On the same day, vaulted —fair vault—a bar 7 feet high.

By the spring of the year 1901, my weight, for some constitutional reason—probably hereditary, had increased to 170 pounds, stripped. At that time I was exercising only with "double bells"; but that the increase in

weight made possible a corresponding increase in strength is shown by the following extract inscribed in the same book: April, 1901.—Pushed two 90-pound dumb-bells, fairly. Also, repeated twice with two eighty-fives; and five times with two eighties.

The above records have not been given as being at all remarkable, for men of greater bulk might have accomplished greater feats, had they pursued the same system; but they show what intelligent training can effect, even with material not best adapted to the particular kind of work.

There are those who maintain that conserving the strength preserves it; and that men who do heavy work when young, lose their strength early, and die prematurely. Than this belief there is none graver. Vigorous use of parts is their life and development; disuse, their decay and death. As brain work maintains a keen intellect, so physical work maintains a strong, healthy body. The man who conserves his strength preserves worn-out structures; whereas he who uses his strength

gains far more than he loses. Why *some* athletes die young will be discussed later.

How apparently marvelous feats of strength are performed is not generally well understood. For example, when we see "strong-men," on the stage, support upon the chest and knees a platform upon which is a grand piano and perhaps a whole orchestra, we wonder that human muscles can bear such a strain. But, as a matter of fact, this enormous burden is not borne by the muscles, but by the bones, which are far stronger. Let us see how this is. The athlete's body is raised to form a hollow square with the floor as its base, the weight pressing upon two points; namely, the tops of the knees, and the upper part of the chest. Now it is easy to see that the strain at the one point is transmitted longitudinally to the bones of both lower legs, which are perpendicular with the floor; and at the other point, along the bones of the arms, which are held absolutely straight, and also perpendicular; the muscles' part in the performance is merely to place and to maintain the bones in

such a position as perfectly to balance the weight. The feat is dangerous; for, should the strong man allow his arms to bend the least bit, or should the weight sway a trifle from its center of gravity, the strain, in either case, would be immediately transferred from the bones to the muscles, which would instantly collapse, and the man would be crushed to death. It is this principle,—the transmittance of strain along the bones,—in a modified form, that enables a man to put up in the manner described on pages 80 and 81, a 300-pound dumb-bell. Were he to stand erect and try to push what he could by sheer muscular force, without "going down," he would lift hardly one-third of that weight.

Possibly you may have noticed that Ameen Abouhamad, the Bedouin Samson of "Buffalo Bill's Wild West," balances very carefully his human pyramid of fifteen full-grown men; and that, when performing this act, he holds his body and legs absolutely rigid. He is a man five feet eight inches tall, and he weighs about 175 pounds.

VI

EFFECT OF EXERCISES OF STRENGTH ON HEALTH—EXERCISES OF ENDURANCE

MANY persons ask, "What is the use of strength?" They might as well ask, "What is the use of health?" For strength means health. In physical work generally, the organic functions are so closely associated with the muscular, that subjecting the muscles to strains, subjects, at the same time, all the organs of the body to corresponding strains. The kind of work that develops *most* muscular strength would, then, develop *most* organic strength. And when one has strong organs as well as strong muscles one has robust health. I admit the real source of health to be organic rather than muscular; but if the work that produces muscular strength, produces also organic strength, which last itself produces health; then is

the *use* of muscular strength too obvious to need discussion. The fact that strong organs nearly always accompany strong muscles, explains why most strong men resist successfully the germs of disease and the deleterious effects of alcohol, tobacco, bad air, etc. To them, the many harmful luxuries of civilized life are harmless.

In his admirable work, "Physiology of Bodily Exercise," Dr. Fernand Lagrange thus expresses himself regarding the physiological effects of exercises of strength: "Exercises of strength demand great muscular expenditure, but they produce all the conditions necessary for energetic tissue-repair. . . . . They occasion less disturbance in the nerves than exercises of speed.

"Exercises of strength and *forced labor,* in spite of the great quantity of work they need, have little influence on the brain; they affect the functions of nutrition much more than those of innervation. The energetic and sustained muscular contractions which they render necessary draw blood to the muscles in great

quantity and keep it there a long time. The muscular fibers benefit from this, and increase in size. On the other hand the blood is enriched with a great quantity of oxygen, for increased respiratory need is the first effect of great expenditure of muscular force. This need finds free and easy satisfaction in the period of repose which inevitably follows each effort. Finally the intensity of the combustions due to a great quantity of work promotes the using up and prompt disappearance of the reserve materials, and the need of quick repair; whence increased appetite. On the other hand the repeated contractions of the abdominal muscles, in the frequently recurring efforts, perform a sort of massage on the intestines which favors the onward movement of the fæces and makes the bowels regular.

"Exercises of strength are then favorable to all the nutritive functions. They increase energetically, and even violently, the working of all the organs of the body, while leaving in relative repose the nerve-centers and psychical faculties. Now calm of the nervous system is

a valuable condition for the repair of the losses sustained in work.

"Observation of facts shows that athletic exercises, when they are not beyond the strength of the subject, place him in the most favorable conditions of nutrition. Under the guidance of a quiet muscular system, the functions of repair are performed with the most perfect regularity, and we see that the acquisitions made by the system through more perfect assimilation exceed the losses brought about by work. Exercises of strength tend to increase the weight of the subject.

"Exercises of strength seem then to deserve the preference from the hygienic point of view, and it is in fact in the professions in which work is taken in large doses that we find the most vigorous persons."

Dr. Lagrange next speaks of the disadvantages of exercises of strength. He says: "In the first place they (exercises of strength) must be performed by solidly constructed organs which are free from all defects of nutrition. The muscles, the tendons, the aponeuroses,

even the bones undergo tractions and pressures which are so violent that ruptures of all kinds would be produced *had not a progressive state of habituation gradually consolidated them.*"

Let us now see what the same author has to say about exercises of speed. "We call those exercises which need the very frequent repetition of muscular movement, exercises of speed. . . .

"If we compare exercises of strength and exercises of speed we find in them the common character of rendering respiration more active. But the exercises of strength only bring about this result at the price of intense muscular fatigue, while the exercises of speed allow the work to be carried on till breathlessness is produced without the muscles becoming painful from the work."

Thus it is possible more thoroughly to oxygenate the system by exercises of speed than by exercises of strength. I concede this; and I have already stated that lighter exercises should always supplement, though never supplant, heavy exercises.

Further, Dr. Lagrange says: "They (exercises of speed) increase the activity of the respiratory functions with less fatigue of the lungs and heart (than that caused by exercises of strength), owing to the absence of *effort* which only exceptionally occurs in exercises of speed, but which is obligatory in exercises of strength."

Here I would direct the reader's attention to the fact that if effort on the part of both organs and muscles is obligatory in exercises of strength, the result of such exercises would be to develop the resisting power of the organs equally with that of the muscles. But no such development would result from exercises of speed; for, according to Lagrange, in these exercises effort is present "only exceptionally."

So, remembering that health is primarily dependent on organic strength, it is a logical inference that exercises of speed not only do not develop so much muscle, but they do not produce such robust health, as do exercises of strength.

The chief advantage claimed by Dr. Lagrange for exercises of speed is that they, of all exercises, oxygenate the system most effectually. Of their disadvantages he remarks: "We may say in a general sense that the fatigue left by exercises of speed is *not reparatory*. It invites less plainly to sleep, and excites the appetite less than the fatigue resulting from a slow expenditure of force.

"The great expenditure of nervous energy which the exercises of speed render necessary is certainly the cause which makes the repair of the system after these exercises more difficult. . . .

"It is then no doubt to the considerable expenditure of nervous energy and to the inevitable prostration which follows it, that we must attribute the loss of weight observed in exercises of speed."

I have quoted freely from this eminent author because his work is notably exceptional in that it analyzes justly and dispassionately the various physiological effects of different exercises—effects that particularly concern

health; moreover, it is the only work that has ever come under my notice which recognizes the value of "strength" exercises. Yet, while Dr. Lagrange admits that heavy weights develop great strength, he appears not to recognize the converse truth,—that light weights do *not* develop strength. For instance he says on page 275: "In prize-fighters the arms are very muscular, but this development which adds to the force of the blow, is obtained by accessory exercises, such as dumb-bells." Here I cannot agree with him. In the first place the arms of most prize-fighters are not "very muscular," and, if they were, their development would not be due to dumb-bells, as no prize-fighter uses heavy ones.

Men who do but little physical work, but who, nevertheless, seem strong, are frequently spoken of as being *naturally* strong. They should be called unnaturally strong; for, assuredly, it is not in accordance with Nature's laws that muscles which are seldom used should possess power. Such men are really freaks. They are generally clumsy and bulky, and

appear not to have the faintest idea how to use the raw strength with which Nature has so lavishly endowed them. On the other hand, the muscles of a trained athlete are perfectly under his control; cultivated muscles being extremely sensitive and obedient to the slightest stimulus. Sandow's ability to move any of his muscles at will is a striking illustration of the high sensitiveness of a cultivated physique.

Apropos of Sandow; I have been told that he ascribes his great strength and superb development wholly to the use of light weights, which he strenuously recommends to all who would be like him. But Sandow uses heavy weights also; so if he is honest in his belief, he has merely mistaken the cause.

Many persons, at some period of their lives, "try to get strong." The vast majority fail through their mistaken conception of how to work. Delicate ones exercise along prescribed lines (which should be proscribed), and, obtaining no result, come to the conclusion that they are not "naturally" strong.

For these, doctors recommend dieting, tonics, change of air, and above all, *rest*. But what they need most is *work*—of the right kind.

On page 31 I proved that it was possible to exhaust the muscles much more profoundly with light, than with heavy, weights. Exercises that necessitate powerful contractions of the muscles can never be continued long enough to produce great fatigue; because, in order to perform such exercises, the muscles must be comparatively fresh. This brings us to the subject of endurance; and whether, from a health standpoint, exercises of endurance are beneficial. In my belief, they are; and they are not. A man who is tired from heavy work is in better physiological condition than one who is exhausted from light work; for, while the former would be able to do light work, the latter would be, for a time, physically prostrated.

Exercises requiring so great efforts as to be utterly impossible for the average man, become for others who are extremely powerful mere exercises of endurance. For example,

I have seen a strong-man put up two eighty-fives twelve times in succession. Plainly, he performed an exercise of endurance as well as of strength. But that is an extreme case. Generally speaking I should say that exercises requiring great, or moderately great, efforts may be continued as long as possible, not only without injury to the system, but with positive benefit; for the fatigue resulting from such exercises, being only partial, is physiological and is followed by an exhilarating reaction. On the other hand, if an *easy* exercise be continued as long as possible, the system suffers, because, in this case, the resulting fatigue becomes almost absolute exhaustion (as was shown on page 31); and, manifestly, what exhausts the muscles exhausts the whole organism, which is the individual. A bicyclist can ride fast for some hours; a man can run fast only for some minutes; so I think running more beneficial than bicycle riding.

Vitality and health show in the countenance. One needs but to observe the haggard faces of

postmen, or six-day walkers, or six-day bicyclists, or long-distance runners, to see that *prolonged* exercises drain vigor. A woman goes shopping; she is on her feet most of the day, bending over counters and waiting for her purchases. When she reaches home late in the evening, her legs, back, and head ache, and, as she would express it, she feels completely exhausted. Very long walks, by depressing vitality, affect appetite and nutrition; delicate persons cannot eat when they are very tired.

In marked contrast to the effects of exercises of endurance proper, are the effects of strenuous exercises. These, because they require considerable exertion, cannot be continued overlong; consequently, they strengthen the body, increase the appetite, calm the nerves and refresh the whole system.

Understand that the above conclusions regarding the effects of easy exercises do not mean that they are always injurious,—only that they are so when prolonged to excess. Moderately indulged in, they are extremely

useful, as well for promoting muscular elasticity and quickness as for accelerating the action of the circulatory organs.

Thus I conclude that the best way to develop endurance, without injury to health, is to prolong moderate, or heavy, rather than light exercises. In applying this principle, however, it should be constantly borne in mind that the terms light, moderate, and heavy, are interchangeable and depend entirely upon their relation to the strength of the performer; that is to say, what is a heavy, or moderate exercise to one, may be a light exercise to another, and vice versa. Exercises that are beyond the strength of the subject are, so far as benefit is concerned, worse than none at all.

A signal advantage of heavy work lies, as I have already pointed out, in its producing big results within a short time; one-half hour of hard exercise three times a week will gain and maintain perfect physical condition. If one gives a dog *sharp* exercises,—such as jumping, or running full speed after a ball,—for only a few minutes each day, he will keep

the animal shapely and muscular, thus obviating the necessity of taking him out for long "airings." A bull terrier that I trained by this method developed into a sixty-five pound dog, and was never sick a day.

VII

HARD-HITTING—THE FIGHTING ABILITIES OF BOXERS AND HARD-HITTERS COMPARED

HARD-HITTING is a subject which I have not yet discussed. But the art of delivering scientifically a heavy blow with either hand is, in my opinion, of more practical use to a man than even the art of self-defense. It is good to know how to use one's strength; it is good to have quick, as well as strong, muscles. Many powerful men cannot hit hard, because they do not know how. Their blows lack speed—as important an element in hitting as force. "Push" blows do little damage. They may knock a man down, but their impact is not great; and it is the impact that counts. It is not difficult to learn to hit properly, yet, like everything else, it requires practice.

Deliver a blow straight from the shoulder.

First, draw the arm well back, holding the elbow in and turning knuckles partly upward; then shoot the arm straight out as forcibly and sharply as possible, throw the weight of the body with the arm, and, at the moment of impact, turn and stiffen the shoulder. That kind of a blow jars; and the jar hurts, if a man be the unfortunate object. As a straight blow is "backed" by the body, it is heavier than a "swing" and harder to stop.

The best bag for hard-hitting practice is a heavy canvas one. This offers considerable resistance if you hit it as it swings toward you. The impacts may at first hurt your wrists and arms, and jar you all over; but persevere, and you will soon be able to knock the heavy bag about as though it were a football. In punching the bag take care not to push it; deliver clean, sharp blows. With practice a strong man can soon learn to hit a terrific blow with either hand.

It is common knowledge that many pugilists cannot hit hard. These "tappers" are often first-rate boxers; they are never first-rate

fighters. Let us compare the fighting ability of a "boxer" pugilist with the fighting ability of a strong man who, while he has no knowledge of boxing, has practiced hard hitting and can, therefore, deliver a very powerful punch. Now, were the pugilist to fight with the strong man, both conforming to ring rules, the pugilist would be likely to win, pugilism nowadays being a fine art. An experienced boxer uses his feet properly, hits and get away quickly, can avoid punishment, and knows just how to tire out his antagonist; in short, he knows ring generalship. Great strength and hitting-power *alone* are not sufficient in a prize ring. But elsewhere, the case is quite different. In a street fight the puncher could probably knock out four or five ordinary untrained men while the boxer was attending to one. So I believe that, regarded practically, strength and hitting-power are more useful than is a mere ability to box.

From these views it must not be thought that I consider boxing unuseful. All active exercises are useful—so useful, in fact, that I

think it would be well here to recapitulate their chief advantages. First, they develop and maintain quickness, thus offsetting any slowness that might result from heavy work; second, they expand and develop the lungs; third, they greatly increase the action of all the excretory organs: which last effect is extremely important, if one be too fat and wishes to reduce his weight. Nevertheless, I no more believe that light, quick exercises should be practiced *exclusively,* than I believe that heavy exercises should be practiced exclusively.

VIII

MODERATE EXERCISES FOR WOMEN—OUR UNIVERSAL NEED FOR EXERCISE

NOW as to the proper exercise for women. Many have thin arms, flat chests and weak backs. For these defects a doctor usually prescribes tonics, and when these fail, as they almost invariably do, he may recommend long walks, bicycling, or horseback riding; exercises that undoubtedly do good, for they fill the lungs with fresh air and increase the appetite, but they are more or less troublesome, and require plenty of leisure time. Besides, how in the name of common sense can a woman develop her arms and chest by means of tonics or leg exercises? Why not recommend arm and chest exercises? Ten minutes every day, or even three times a week, of steady but vigorous work at the chest-weights, performing the few motions described

in Chapter III, will make a woman's arms and shoulders plump, round out her chest, and greatly improve her figure generally, to say nothing of what it will do for her complexion.

While the weights may be fairly light at first, they should be increased proportionably with the subject's strength, so as always to tire her after ten or fifteen minutes of continuous exercise. All the movements should be performed *consecutively,* from twenty to thirty times each; for, as the different movements exercise different muscles, changing from one to another is sufficient rest.

Other women do not complain of thinness; corpulency seizes them, especially in and after middle life. In their case vigorous use of the chest-weights will cause a *reduction* of flesh.

The seeming paradox of the same exercises making some persons smaller, and some larger, is easily explained. Work, which causes an increased flow of blood to the muscles, has a double effect: it breaks down, and it builds up; for the blood which contains the element that consumes substance—oxygen—also carries

nutriment to deposit in the place of what it takes away. Now when "poor" muscles—muscles deficient in fat, an unstable element—undergo exercise, the blood deposits more than it consumes; in the case of large, soft muscles, rich in fat, exercise has a reverse effect,—the blood consumes more than it deposits.

There are many other exercises which a woman can advantageously practice at home. With a pair of ten-, fifteen-, or twenty-pound dumb-bells, depending upon her strength, she may perform the curling and pushing movements described on page 72; also the "see-saw," described on page 79. But she should use no weight with which she cannot repeat consecutively fifteen times.

Again, she may place the seats of two chairs as far apart as the width of her shoulders; then, with her toes on the floor, a hand on each chair, arms straight, and maintaining her body as an inclined plane, she may dip down until her shoulders come level with the seats, and push up to straight arm again. With practice she ought to be able to repeat this movement from

ten to twenty times. The result of the exercise will be to round out the chest, and so to strengthen the muscles of that region as to make them capable of holding up the bust.

Punching a light canvas bag, hitting out straight from the shoulder, alternately with each hand, is another excellent exercise for a woman's arms, chest and lungs.

The two abdominal exercises, described on page 70, will do much to keep the bowels regular, and will prevent a "stomach."

For leg exercises, a woman may "squat" and rise, taking care to maintain the body always perpendicular with the floor; raise up, and lower down, on the toes, keeping the legs straight; then, standing on the left leg, she may swing the right, first as far backward and up, and then as far forward and up, as possible. Next, standing on the right leg, she may swing the left in the same way.

The practice of balancing and carrying moderate burdens on the head is useful to round the muscles of the neck and throat; besides giving one a graceful carriage. (Additional

exercises for women will be found in Chapter X.)

The exercises above specified are strenuous enough to produce results, without any danger being incurred. They will also awaken interest—an important factor in exercise. For the subject may from time to time slightly increase her weights, in the weight exercises; and the number of repeats, in the dipping, abdominal, and squatting movements. Moreover, the delightful feeling of strength—which a woman will experience after only a few weeks of the training indicated—will make her loth to go back to the old listless weakness.

As to the amount of exercise necessary; that will depend entirely upon the endurance and strength of the subject. A safe general rule is to discontinue any exercise as soon as the muscles have become too tired to perform it *vigorously*. After a rest of a few minutes, the exercise may be renewed, and continued until the muscles again begin to tire. Exercises, interrupted by rests, may be renewed until a point is reached where the muscles feel tired

at the very commencement of the exercise; at that point stop the exercise for that day. If you do not, you will lose at least what you have gained, and perhaps more.

Beginners are prone to become discouraged, because a very little vigorous work, especially when it involves the upper muscles, fatigues them quickly. Let them recollect that a very little of the right kind of work to-day prepares them for a little more work to-morrow; and that for still more work the third day, and so on.

It is a most curious fact that persons will spend large sums for advice from high-priced physicians; they will turn their backs on business, home, friends, in order to go abroad for their health; almost give up eating, subsisting only upon nauseating food; all for what? Perhaps to cure dyspepsia. But it is obvious that they need do none of these things. They require simply—exercise.

Man, being an animal, must have exercise, would he remain healthy; and if this exercise be of the right kind, it will develop not

only strong muscles, but also a strong heart, strong lungs, and a strong stomach—a combination that invariably produces robust health.

What is not used wastes and decays. Many examples of this universal natural law might be cited. Blind fish inhabiting subterranean streams, the blind animals in the caves of America and of Europe, were all born with functional eyes which, after a time, lost their power of vision through disuse.

In "The Origin of Species," page 395, Darwin says regarding the genesis of rudimentary organs: "I believe that disuse has been the main agency; that it has led in successive generations to the gradual reduction of various organs, until they have become rudimentary, —as in the case of the eyes of animals inhabiting dark caverns, and of the wings of birds inhabiting oceanic islands, which have seldom been forced to take flight, and have ultimately lost the power of flying."

That the muscular power of the average man is less than one-half of what it should be, is proved by the fact that a short course of pro-

gressive physical training will more than double an ordinary person's strength. Is it surprising, therefore, that there is so much disease and suffering? What refined, delicate, intellectual people most need is a little coarse strength; and to obtain this, it is not necessary to devote one's whole time to all kinds of athletic exercises. On the contrary, almost anyone can develop "coarse" strength and "disgraceful" health by working *properly* for only a few minutes each day, or even but three times a week.

IX

EFFECT OF LIGHT EXERCISES ON STRENGTH AND HEALTH—WHY ONE SHOULD BE WHOLLY STRONG

IN former times, when common sense was commoner than now, and there was little "book science," men believed that hard work made them strong. Knights wore armor weighing a hundred pounds or more, and were none the worse for the wear. In this "enlightened" age the hard-work notion is poohpoohed. Effort necessary to become strong? Nonsense!

Calisthenics—a term derived from the Greek words, *kalos,* meaning beautiful, and *sthenos,* strength—is the euphemistic name of one "improved" method of physical culture. It is a light-exercise system; so I cannot concede that, *per se,* it will produce either strength or symmetry.

Swedish gymnastics and the system of Del-

sarte also claim much. But neither can promote strength, because neither involves any hard work.

Others claim that mere massage will develop all muscles equally and sufficiently. Now were this true (fortunately it is not) its effect would be bad; for, if muscles should be developed, and not organs likewise, then, by the law of Compensation of Growth, as muscular strength increased, organic strength would diminish.

Still another cult would regenerate mankind, by breathing exercises; and by those alone.

Here it may be remarked that, as the foregoing "quack" exercises are taken in homeopathic doses, they must be repeated frequently; otherwise they will do not even the smallest good.

People believe in the above far-fetched "systems" because they point out easy roads to health and strength; and man is ever prone to credit alluring possibilities, rather than harsher facts. It is easy to perform light exercises; it is still easier to submit to having one's

muscles rubbed; and it is easiest of all to breathe, even though that be in a special way. As men would have money without earning it, so would they have strength without working for it.

Ponce de Leon sought a "Fountain of Perpetual Youth" throughout Florida. Alchemists have sought, and chemists are still seeking the "Elixir of Life." Not long ago, Dr. Brown-Séquard announced to the world that he had made this precious fluid, and had tried it on himself with wonderful results. It seems hardly necessary to add that more extensive experiments with the stuff proved it worthless to prolong existence.

The fact that the proprietors of patent medicines grow rich from the sales of their nostrums, strikingly illustrates the readiness with which man believes what he wishes to believe. For example, advertisements like,—"Take Strengthine for strength,"—"Eat Ozinine for energy," or,—"Proxie feeds the nerves,"—appeal irresistibly to the average human mind. On the other hand, the bald injunction

to *work*—something that man dislikes—fails to impress.

The bias excites pity, when we consider how very much more than the mere eating of any kind of "health" food, *work* will do in the promotion of health and strength. Nowadays few men feel obliged to work for health—they take pills.

All of us like to hear pleasant things; and although our common sense would tell us they are untrue, yet we try our level best to believe them. Is a man fat, he lends a willing ear to the quack informing him that a drug will make him strong and symmetrical. A few believe in work as a means to health; but these a false science assures that gymnastics produce deformities, and that heavy weights are an abomination. "The strongest man should never use dumb-bells heavier than ten pounds," it says. Another of its astonishing declarations is, that putting up light weights many times will develop greater strength than putting up heavy weights a few times.

Let us subject this last statement to the

reductio ad absurdum test. We assume the assertion to be true; then, as putting up heavy weights eminently requires strength, one who exercises exclusively with light weights, would be able, did he try, to put up heavier weights, than would one who exercises exclusively with heavy weights. But such is practically never found to be the case. Hence the assertion is absurd.

If science should continue to reason as above, its advice to athletes would be something like this. High jumpers, who would learn to clear a bar six feet high, should jump many times over a bar three feet high. Sprinters should run fifty miles each day. Fighters, in order to learn to hit hard, should punch an air-bag, which offers little resistance, and can therefore be punched for a long time. Trying repeatedly to knock the wind out of a bag should enable one easily to knock the wind out of a heavy man.

But science does not reason thus regarding most athletic sports. Sprinters are told to practice sprinting—not to run long distances;

and high-jumpers, when training, know that they should jump each day as high, or almost as high, as they can. Why, then, when science advises men on the subject of "How to get strong," does it recommend exercises requiring so little strength that they can be performed indifferently by women, or by children?

Exercises that develop endurance cannot be compared with those that develop strength. Lifting ten pounds ten times is quite different from lifting one hundred pounds once; and the respective effects of the two exercises are quite different. He must be a strong man who does the one; a weak man, or a woman, may do the other. A child can run about the whole day, or can walk long distances, without fatigue; but this ability to endure does not argue that a child could push five hundred pounds on a leg-testing machine.

The development of Sandow's thighs is tremendous, and he can lift enormous weights with those muscles; yet he could not beat Miller or Pierce in a six-day bicycle race, notwithstanding that the bicyclists' legs are not half

so strong as Sandow's. And, in passing, if it be true that comparatively slight, but long-continued strain develops bigger and stronger muscles than does severe strain continued for only a short time, how happens it that long-distance runners and bicyclists do not have bigger and stronger legs than those possessed by professional weight-lifters?

To excel in any athletic exercise, it is necessary to practice that exercise *in its proper degree.* This principle holds good, whether the exercise be sprinting, distance-running, high-jumping, or heavy-weight lifting. So, he who practices with light weights that he may be able to lift heavy weights, is as mistaken in his ideas on training as he who jumps many times low in order to be able ultimately to jump high.

It is in accordance with the physical economy that what we do not need we do not have. To perform exercises of endurance muscles need not be strong; witness that frail women often possess greater endurance than strong men. On the other hand, to be able to lift heavy

weights, muscles *must* be strong. Consequently, if a man by gradual training learns ultimately to lift heavy weights,—and it may be practically demonstrated that this is easily possible,—he must inevitably become strong.

Conversely, it follows that the practice of light exercises, not requiring strength, does not acquire it. It is true that, after having practiced, a man can lift a light weight more successive times than he could at first; but his muscles will not have gained strength thereby —merely, they will have become enduring. Muscles may contract never so often, but if never with intensity, they will never acquire power.

The theory that the long-continued use of light weights will develop greater strength than will the brief use of heavy weights, is, as I have repeatedly asserted, untrue. It attracts by implying a big reward for little labor. But elsewhere I have shown that a light exercise system, *per se,* by no means begets a "big reward"; further, as it obliges us to "work" for many hours each day,—thus nervously

exhausting us,—it does not involve "little labor."

This system, then, really necessitates *much* labor, as regards quantity, for *little* reward. It should be remembered, however, that if light exercises are not *all-sufficient* for a *complete* system of physical culture, they are yet useful, as has been before mentioned, as adjuncts to a progressive system.

The question as to how strong a man may become is interesting. Many assume that men who are much developed from having followed arduous occupations—blacksmiths or longshoremen for example—have reached their respective limits of physical strength. Such is not the case. They have acquired sufficient strength to do their special work, and that is all. Give them still harder work to do, and their muscles will soon adapt themselves to the increased demand made upon them; that is to say, they will become stronger.

Take a blacksmith and train him by the Progressive System to perform feats of strength, and, though he may be forty years old, yet

he will, after a time, become as much stronger than he was, as he had been stronger than the average man.

This fact is but another argument that one's strength develops proportionally with the intensity, and not with the quantity, of work done. No doubt our forty-year-old blacksmith had worked for years many hours daily at his trade, which, moreover, was not a "light" occupation; and yet, when he afterwards demanded of his muscles still more vigorous contractions, they increased greatly in force.

Naturally, there is a limit to the development of strength; but only a few attain to it. Sandow is a notable example of the acme which human development may reach.

The oft-raised objection, that heavy-weight lifting overstrains the heart and other vital organs, has already been answered. The heart is not nearly so delicate as people imagine. Understrain of the heart, with its consequent weakness, kills far more persons than overstrain; "heart-failure" is perhaps the most common of the many diseases to which the

sedentary are liable. Sclerosis, or the thickening and hardening of various tissues, is another disease peculiar to the inactive and the elderly. Exercise is a preventive, and its best-known remedy.

Another erroneous notion, prevalent even among physical culturists, is that the using of heavy weights injures the *muscles*. When we consider what violent strains the leg muscles undergo with impunity, and that these strains are often sudden, as in high-jumping, we become fully aware of the fallacy of such a statement.

If man would be advised by his common sense, rather than by scientific conclusions based on false premises, he would not be the unsymmetrical animal that he is. No man, *disproportionally* strong, can be perfectly healthy and symmetrical; and, the claims of physical-culture teachers notwithstanding, heavy work habitually for the lower half, and light work habitually for the upper half of the body, do not, and never will produce either general symmetry or equality of strength.

The prime object of the present work is to point the pathway to *health;* but weakness is not health, and strength is, those parts being healthiest which have attained their acmes of strength. Therefore, I am of the opinion that the secret of health will be found in the correct solution of " How to get strong."

The assertion that strong men are often not healthy and are short-lived, misleads in its omitting to qualify the term " strong " by " partly." He who is *wholly* strong is necessarily healthy; whereas he who is partly strong, and partly weak, is liable to perish prematurely through the breaking down, not of his strong, but of his weak and, consequently, unhealthy parts. Thus is general strength transcendent to mere local force.

X

EXERCISES TO PROMOTE ELASTICITY AND SUPPLENESS—EFFECTS OF COMMON ACTIVE EXERCISES

ALTHOUGH, in the course of this writing, I have taken exception to, and even ridiculed, the wholesale claims made by light-weight extremists for their system, yet I have frequently had occasion to remark *one* advantage of light exercises. To promote elasticity and quickness, they are, as I have often said, valuable. It therefore seems proper that I should now give some specific directions as to how such exercises should be performed. While these exercises may not be particularly interesting, none the less will men, women and children do well to practice them to a certain extent, not indeed as a means to develop strength, but to stretch the muscles, and to keep the body mobile. Here are some useful ones.

First movement. Stand straight, with the heels together, toes slightly out-turned, chest out, stomach in, head and shoulders back; now lift the arms, extended straight, up in front, and as far back over the head as you can, at the same time stretching the legs, body and arms as much as possible, and taking in a deep breath; then, without bending the knees, and keeping the arms always straight, bring the body forward and down, and try to touch the toes with the tips of the fingers: exhale. Repeat this movement slowly ten times, counting down and up as one. After a little practice you may be able to touch the knuckles to the floor.

Second movement. Stand as before, with the arms straight at the sides, and, without moving the legs, incline the body and head first to the right as far as you can; then to the left in the same way. Repeat ten times to the right, and ten times to the left.

Third movement. Stand as before; then, with the arms spread as wide apart as possible, and horizontal with the floor, twist the body

Plate XXIII. SQUATTING EXERCISE.

strongly to the right, and to the left, the legs not altering their position. Repeat ten times in each direction.

Fourth movement. Extend the arms straight out in front, and, keeping them straight and always horizontal with the floor, throw them back as far as you can. Repeat ten times. Some persons can bring the backs of the hands together behind the shoulders.

Fifth movement. Stand with the arms straight at the sides, palms turned out; now, keeping them straight, take a deep breath, and bring both arms out from the sides and slowly up until they meet above the head; exhale as the arms are brought slowly down in the same way. Repeat ten times. This will broaden and deepen the chest from the inside.

The seven chest-weight exercises given in Chapter III. will do much to limber the shoulders and arms.

Sixth movement. Swing a pair of five-pound dumb-bells between the legs, bending the knees; then toss them to the shoulders, and push them up to straight arm above the head,

leaning well back, and reaching up as high as possible; lower them to the shoulders, throw them out in front, down, and between the legs again. Repeat fifteen times.

Seventh movement. "See-saw" the five-pound dumb-bells in the manner described on page 79, bending well to the right and to the left, and reaching up as high as you can. Repeat about ten times with each hand.

Club-swinging is excellent for keeping the joints pliant.

Eighth movement. Stand straight on the left leg, and swing the right, bending the knee only slightly, as far backward and up, and then as far forward and up, as possible. Next, standing on the right leg, swing the left in the same manner. Repeat each movement ten times. See Plate XXIII.

Ninth movement. Stand straight; then squat and rise, maintaining the weight, when squatted, on the toes, and keeping the body always upright. Repeat from ten to twenty times.

While performing any of the above exer-

cises, in which the time for breathing is not specified, breathe not too often, but deeply. I have little faith in the *plain* breathing exercise, which, being performed when the system is in no need of such a superabundance of oxygen, often causes dizziness. Vigorous work will give one all the "breathing exercise" that he or she requires.

I shall now just mention the effects of the more common indoor sports; namely, handball, boxing, fencing, tumbling, and wrestling. These are more interesting than the light exercises just detailed. They are of great value to promote activity and quickness, to increase lung capacity, to accelerate the circulation, to stimulate the action of all secretory and excretory organs.

Handball is an excellent game to indulge in after one has performed heavy work. It lightly exercises both arms, at the same time necessitating a great variety of movements, heavily, but actively, exercises the legs, trains the eye, improves the "wind," and soon brings on a profuse perspiration; this last effect being

especially desirable if one wishes to reduce weight.

Boxing requires speed and activity on the part of all the muscles. It effectively counteracts any "slowness" that might result from the exclusive use of heavy weights.

Fencing is splendid practice for the eye, wrist and arm. But one should learn to fence equally well with either hand.

Tumbling is fine exercise for all the muscles of the body. If various "brother" acts be performed, *every* muscle does strenuous work: this results in a symmetrical development. Moreover, because of the incessant activity of the exercise, *all the internal organs* benefit to a remarkable degree.

Wrestling is another universal exercise. It is essentially heavy work, particularly when the opponents are evenly matched. As wrestling puts a heavy strain on every muscle in the body, it quickly causes breathlessness. Hence this popular sport not only much develops *all* the muscles, but it vigorously exercises the lungs, and greatly accelerates the circulation. Apart

from the more or less risk that inevitably accompanies any sport, I see but one objection to wrestling: the strains that, in its practice, are necessarily put upon muscles and organs cannot be graduated. A wrestler is apt to exert himself for a longer time, and with more intensity, than is physiological.

XI

ATHLETIC SPORTS AND SWIMMING—EXERCISES FOR BOYS AND GIRLS

OUTDOOR athletic sports are our next consideration. These may be performed in the open air,—which is an advantage; but only in certain seasons,—which is a disadvantage. Again, they tend to localize development—distinctly another disadvantage. (See Chapter XII. pages 144-148.)

Runners and jumpers are strong in the legs and lungs, and frail everywhere else. Muscularity above the waist would be a handicap to either of these classes of athletes. Bicyclists also are likely to be "all legs." Shot-putters are "one-arm" men. Football is more general; but here again the legs do the major part of the work. So with baseball. Tennis is excellent for the legs, and for the right arm. Golf is a mild exercise, with the merit of using one pretty evenly. Horseback-riding is fine

exercise for the horse, and good for a man's legs. Rowing, when a sliding seat is used, is heavy work for the legs, back, shoulders, forearms and wrists; it does little for the upper arms and chest.

We pause at swimming. This, of all outdoor athletic sports, stands pre-eminent. No other popular exercise employs so evenly all the muscles. To get the best developmental results, one should swim in a variety of ways,—on the stomach, using the breast stroke; on the right side; on the left side; and on the back.

Swimming on the stomach and on either side develops the back, the loins, the back part and sides of the neck, the wrists and forearms, the back part of the upper arms and shoulders.

Swimming on the back—by raising the arms out of the water, at each stroke, and throwing them back until the hands are level with the shoulders, where they catch the water, and are brought in to the sides—develops the abdominal muscles, the chest, the front of the neck, the wrists and forearms, the front part of the upper arms and shoulders.

The alternate flexions and extensions of the legs, also necessary in any of the four styles of swimming, develop all the muscles of those members.

We thus see that swimming is eminently a general exercise; which, moreover, can be made light, medium, or heavy, according as one swims slowly, at moderate speed, or fast. For, obviously, the more vigorously one's arms and legs are forced through the water, the heavier is the strain on the muscles.

Each swimmer can, then, suit his exertion to his strength. Hence he may, by exerting himself a little more each day, finally increase his whole strength to a great degree, through this *one* exercise. Again, swimming, like tumbling, being general and incessant in its action, will develop, as well as all muscles, all the organs that minister to them. To be wholly appreciated, the added advantage of breathing large quantities of pure, dust-free air needs to be only mentioned.

Now as to exercises for the boys and girls. To begin with, no growing boy or girl should

indulge in very heavy work. Up to the age of about eighteen years the frame is not sufficiently "set" to permit of excessively hard work.

Babies get splendid exercise, by screaming, and by throwing the limbs about. When older, they develop their chests and arms, in fact most of their muscles, by crawling; from doing which they should never be restrained. Later they learn to walk.

Boys from ten to sixteen years old ought to jump, vault, skate, coast, swim; to play at tag, at hare-and-hounds, at leap-frog, at base-ball, at football, and at other games dear to the heart of every true boy. If they try to stand, or to walk on their hands, or persist in turning handsprings and "cartwheels," so much the better. None of these tricks will do them any harm. Wood-chopping, carpentering and tree-climbing are also excellent for a boy's muscles.

Girls should play at games too. And they will be benefited by light housework; such as dusting, sweeping, making the beds. They may even wash clothes, provided they are care-

ful not to do too much of it. Sweeping is fine exercise for the arms, shoulders and chest; washing, for the arms, shoulders, chest and back.

In addition to the common exercises mentioned above, boys and girls may, with great benefit, perform the nine light-exercise movements given in Chapter X. The seven chest-weight exercises described in Chapter III., curling and pushing two dumb-bells simultaneously, and "see-sawing" them (see Chapter V. pages 72 and 79), will also do much toward strengthening juvenile arms, chests and backs.

But the chest-weights and dumb-bells should be respectively light enough to admit of each movement with the former being repeated twenty-five times; and each movement with the latter, at least fifteen times. Little children must not use the same weights as larger children.

XII

THE STRENGTH AND SYMMETRY OF MAN COMPARED WITH THE STRENGTH AND SYMMETRY OF ANIMALS

CIVILIZED man, the noblest of all animals, is the most unsymmetrical. Yet we all love symmetry of form: the old Greeks and Romans even worshiped it. In remote ages sculptors and artists molded and painted the nude forms of their gods and goddesses, heroes and heroines, so skillfully, that the works of some of the old masters seem to us almost sublime in their perfection of outline. What man or woman in poetical ancient Greece would have worshiped a pot-bellied god, or a scrawny-necked goddess? It is sad that many men in our modern times, whose fine brains and ripe judgment command the respect and admiration of the world, should possess bodies so disproportioned as to be grotesque. Luckily the numerous memorial statues which we

erect at the present day represent our heroes properly dressed. Dress, like charity, covers a multitude of sins.

Wild beasts are seldom badly proportioned. A hunter safely perched on the back of an elephant cannot but admire the tense muscles and beautiful symmetry of the tiger creeping stealthily through the jungles of India. The African lion is magnificent in the majesty of his tawny strength; and the wild horses that roam the deserts of Arabia are models of grace and beauty.

The problem of exercising our domestic four-footed beasts is easy. When a horse or a dog runs or jumps, *all* its muscles contract powerfully and actively; and these equal energetic contractions of all the muscles develop well and evenly the whole animal. As a consequence most quadrupeds are symmetrical. Make a horse or a dog run fast for fifteen minutes every day, and it will keep in good condition and retain its natural graceful shape. But what exercise can a man take that will develop well and equally all his muscles? Walking,

running and jumping, natural movements for the human animal, exercise energetically only the muscles of the lower limbs.

Although the majority of men are non-athletic, yet they have well-developed legs, because they are obliged to use them more or less every day in attending to the ordinary duties of life. They must walk a little, if only to a street car; they are often obliged to stand, and they must go up and down stairs several times a day. Recollect that leg work is necessarily heavy work, the legs having to support the entire weight of the body. Climbing stairs is particularly severe exercise for the lower limbs. But the most important and best parts of a man's body, namely, the arms, shoulders, chest, back, loins and abdomen, are, ordinarily, hardly used at all, the little work that they do being as light as possible.

The inevitable result of light work for the upper muscles and heavy work for the lower muscles is loss of symmetry, which becomes especially noticeable during and after middle life. Persons with bad, and even ridiculous

figures have become so common that they attract, in public assemblages or on the street, no attention or comment whatever.

Why non-athletic men gradually lose their symmetry is easily explained. The abdominal muscles are never called upon to bear a strain equal to that which the leg muscles are daily subjected to; consequently, as the legs become strong and shapely, the first-named muscles waste and become weak, the cumbrous fat disappearing from the lower limbs to be deposited about the abdomen; for, while powerful muscular contractions destroy and prevent the formation of fat, feeble contractions cannot keep away this health-destroying incubus. For the same reason,—lack of hard work,—the arm, chest, back and shoulder muscles, become weak, flabby and infiltrated with fat.

The modern physical culturists who seek to correct this tendency of man to inequality of development, by recommending *light* exercises for the arms and chest, either forget that the legs do *only* heavy work (a little thought will convince anyone that the legs never perform

light exercises), or else they fail to recognize the obvious parallelism that, it being natural and physiological for the leg muscles to do heavy work, it cannot be unnatural for the muscles of the arms and chest to do likewise. We may expect that so long as man continues to use his muscles unequally, so long will his lack of symmetry be accentuated. A man's body and arms should be as strong, proportionably to their size, as his legs; which condition can never be attained without the body and arms performing a considerable amount of heavy work.

Business men, doctors, lawyers, teachers, salesmen, clerks, overseers, detectives and policemen, are not obliged by the exigencies of any of these callings to do regular hard work with the muscles above the waist; so, it being a natural instinct of all animals (man included) not to do that which they are not obliged to do, it is hardly surprising that, among these, an evenly-developed, symmetrical man should be the exception rather than the rule. On the other hand, blacksmiths, men who work in iron

foundries, porters, wrestlers, and weight-lifters, *are* obliged to use vigorously their whole physique; and these men are usually symmetrical.

The conclusion we reach, then, is that while animals—especially wild animals—are, as a rule, symmetrical, man is, as a rule, unsymmetrical. Animals develop *evenly,* and fat is not deposited more in one place than in another, *because all their muscles are subjected daily to nearly equal strains.* Man develops *unevenly, because he subjects his leg muscles to strain and none other.*

Let us now look to the effect of unequal development on the general health. The law of Compensation, or Balancement of Growth, as expressed by Goethe is, that " in order to spend on one side, nature is forced to economize on the other side." Darwin, commenting on this law, in "The Origin of Species," says:—"I think this (the above law) holds true to a certain extent with our domestic productions: if nourishment flows to one part or organ in excess, it rarely flows, at least in excess, to

another part; thus it is difficult to get a cow to give much milk and to fatten readily."

That the foregoing theory is *practically* true, observation of facts witnesses. Professional bicycle riders, runners and jumpers, have, usually, weak bodies and puny arms. Excessive work with the legs, so far from adding to the general strength, as is widely believed, tends actually to weaken all other parts not energetically associated in the work. What follows explains why this is so. Every animal body contains a definite limited amount of blood, which, under ordinary physical conditions, performs in circulation its double function of burning up and carrying away waste products of muscles and organs, and of depositing new material,—*impartially;* that is, the circulation in an animal undergoing little or no exercise is comparatively even, and, consequently, all parts are equally well nourished. On the other hand, when certain muscles or organs are habitually used vigorously, other parts not associated with those movements to any material extent are, for the time being, deprived of their

normal quantity of blood; for the circulation, during *special* exercises, is rendered uneven, the blood flowing in *excessive* quantity to those parts actively involved in the work. Now we know that all parts derive their nourishment from the blood. Hence we may deduce the extremely important principle, which, though obvious, has apparently not heretofore been clearly recognized by physical culturists,—namely, that particular exercises, by drawing to particular parts more than their rightful share of blood, develop those parts *at the expense of all other parts not associated in the movements.* If we diminish the quantity of blood flowing to a part, by so much do we retard that part's development.

Thus we see how special exercises strengthen parts associated at the expense of parts not associated; and as the human organism, like a chain, is no stronger than its weakest part, the immense importance of employing general exercises to strengthen all parts proportionally becomes manifest. Now I have shown that the legs habitually do heavy work; therefore, if the

arms and the great muscles intimately associated with their movements are to become proportionally as strong as the legs, they also must do heavy work. In bicycle riding—an exercise which may be continued for a long period of time—the concentration of the circulation in the lower limbs is seriously detrimental to the proper nourishment of the muscles above the waist.

It has been often said that athletes die young, and there is some truth in the assertion. But the law of Balancement of Growth explains this seeming anomaly. We have shown that certain parts of those who do an excessive amount of work with the legs—runners, jumpers, bicyclists, etc.—are weaker than they otherwise would be had the subjects never performed any kind of athletic exercise whatever. Again, weight-lifters and gymnasts frequently develop external muscles at the expense of internal organs.

Exercises, to be beneficial and to promote longevity, must be sufficiently diversified in kind and amount to develop all the muscles and

organs of the entire animal nearly equally. Muscle workers should also run, and perform quick exercises; runners should do *some* muscle work. *All* should remember that important as it is to have strong muscles, it is of transcendent importance to have strong organs; for, on *organic strength,* as I have before observed, depends general health. A powerful man with a weak heart would be likely quickly to succumb to pneumonia; whereas a man muscularly weak, but possessing a strong heart, would have an excellent chance for recovery.

There is another element that cuts short the lives of athletes—I mean, competition. To be physiological and therefore beneficial, no exercise should be continued to the point of extreme fatigue; which is an almost necessary condition in competitive athletics. Finally, athletes often dissipate, their very strength encouraging an abuse which they flatter themselves they can withstand.

In 1885 Maud S. trotted a mile in 2.08¾, making a world's record. In 1903 Major Delmar trotted the same distance in 2.00¼; Cres-

ceus, in 1.59¾; and Lou Dillion, in 1.58½. A comparison of these figures shows a development in the speed of trotters, within eighteen years, that is simply amazing. But man's speed in running has not increased in the same rapid ratio.

There is a reason for this. In man, complex mental qualities interfere with, and often nullify inherited physical capacities. Thus the son of a great runner is not necessarily trained to run—he may have some other ambition; nor are the son's children, nor his children's children. On the other hand, horses bred from racing stock are trained to speed almost from birth; and these foals (originally advantaged by an inherited capacity), after they have developed, frequently outdo their parents. In the successive generations of animals, the constant tendency is for progeny to surpass their ancestors. There are generations of race-horses; rarely generations of race-men.

When we speak of "man's progress," we mean, usually, his mental progress, the achieve-

ments of mind having been far greater than any physical achievements. As man has improved mentally, he has retrograded physically. Compare the sense organs of sight, smell, and hearing, and the average powers of endurance, in primitive man, with the like physical attributes of the present generation. Should this one-sided development continue? I think not. For did man develop his physical powers more, his brain power would be greater, seeing that the brain is merely a part, albeit the most important part, of his physical organization. In my chapter on "A Parallel between Mental and Physical Culture" I shall discuss this subject more fully, and shall endeavor to show just how important it is for brain workers, above all other men, to develop their physical strength.

When the late Robert Ingersoll casually remarked that were he sovereign of the universe, he would make health catching, disease unknown, and do away altogether with poverty, hunger and kindred discomforts,—his ingenious brain evidently failed to realize the sublime

utility of painful conditions. All development, and, consequently, all progress, are the products of effort, which would be impossible did nothing exist to be overcome. Moral, mental, and physical health depend upon exertion. Temptations and evil conditions are to character what heavy weights are to muscles. The exertion demanded has for a result, development. Just as physical ease would produce physical weakness, so would characters deteriorate in comfortable environments. It is not heredity alone that makes self-made men strong; much more is their strength due to the development consequent upon constant resistance. But these observations are more psychical than physical.

Many wild beasts would not exercise sufficiently to keep in good health, were it not that, driven by the pangs of hunger, they are frequently obliged to forage for food. Domestic animals, not being forced to work for their food, are generally lazy. Though it is natural for a puppy to run about and play, a full grown dog will merely sit around and look at you in

a dignified way—when he is not asleep. A dog must be taken out and made to run, or he will get fat, lazy, and out of condition. Country dogs are usually fat and good-for-nothing; for, contrary to popular belief, they run about very little.

The gorilla, the type of animal most nearly resembling man. unlike the *genus homo*, uses his arms as fully as his legs; he walks on all-fours, or climbs from one tree into another by seizing a branch with one of his powerful arms, and pulling up his heavy body. This animal has great strength, and can easily lift a man from the ground with one hand. The lion often kills its prey with a single stroke of its paw. It can pull down an ox, or pick up a man in its mouth, and trot off with him, just as a cat runs away with a kitten. An eagle with a lamb in its talons can rise from the ground by beating the air with its great wings.

The swimming and leaping powers of salmon are remarkable; as is also their determination in overcoming obstacles. "They [salmon] employ only three months in ascending to the

sources of the Maragnon (a journey of 3,000 miles), the current of which is remarkably rapid, which is at the rate of nearly forty miles a day; in a smooth stream or lake their progress would increase in a fourfold ratio. Their tail is a very powerful organ, and its muscles have wonderful energy; by placing it in their mouths they make of it a very elastic spring, for letting it go with violence they raise themselves in the air to the height of from twelve to fifteen feet, and so clear the cataract that impedes their course; if they fail in their first attempt, they continue their efforts until they have accomplished it." (Kirby, "Hist. Habits and Instincts of Animals, vol. i., p. 119.)

Ants carry objects many times their own weight. The prodigious strength of beetles is well known.

I believe that throughout the entire animal kingdom there is no species which, in its natural state, does not possess sufficient power *within itself* to kill other animals—at least, those of its own kind; whereas men, in order to kill the larger mammals, or even one another,

must employ weapons. Thus we are forced to conclude that all animals are proportionally stronger and more able, physically, than is man.

Volumes have been written on the wars of ants. Those redoubtable insects engage in pitched battles for the purpose of capturing pupæ, which they afterwards nurture and then enslave. When reading descriptions of their frightful conflicts, I have marveled at how the lust of battle must stir these small warriors, and at the intense joy they no doubt experience as, armed with no weapons but their mandibles and the strength of their little bodies, they close in deadly combat. How tame in comparison seems the civilized warfare of men, who shoot at random toward an opposing army, distant perhaps a mile!

Most animals labor that they may rest; but the ants typify this instinct most strikingly. In summer they store large quantities of food in "granaries" against the approaching winter; they also capture and imprison aphides—small insects that secrete a sweet juice of which ants are very fond. Again, ants maraud to

obtain slaves, a work undertaken especially for the sake of ease. Indeed, *formica rufescens,* that keep many slaves, are so helpless as to be unable even to feed themselves; their slaves having to pour nourishment down their throats to keep them alive. But abroad the masters are by no means helpless; their mandibles which, through disuse, have been rendered impotent for feeding, can still bite their enemies; hence they remain able to capture enough slaves to supply their needs.

The nests of honey-making ants (*Myrmecocystus Mexicanus*), which are found in Texas and New Mexico, are guarded by a black species of that genus, whose mandibles, according to the authority of Capt. W. B. Fleeson, are so powerful that they can tear into pieces insects as large as spiders, wasps and even beetles.

We shall now compare the strength of *trained* men with that of animals. By trained men I do not mean professional runners, jumpers, bicycle riders, or even boxers; I mean athletes who have become strong all over by

doing heavy hard work with all their muscles; men whose arms are as strong as legs, and whose chest development reminds one of the famous old Grecian statues.

In "Quo Vadis" we are told how a gigantic man named Ursus seizes an enormous bull by the horns, and slowly twists its neck until he breaks it. The story is manifestly absurd, for the neck of a bull is tremendously thick, and it is the strongest part of this strong animal; and no man, unless he were about fifteen feet high and built proportionately, could overcome a bull in a trial of mere brute force. It might be possible, however, for a very strong man, who was also skilful, to *throw* a bull. The athlete, after seizing the bull by the horns, might, by a sudden twist, throw the top-heavy brute off its balance. A newspaper printed an account of the attempt of a "strong-man" to throw a bull, which failed lamentably. But the bull was of the short-horned variety.

In Virgil's "Æneid" is given a most graphic description of a boxing match between Dares and Entellus. Those heroes fought with the

cæstus, a kind of gauntlet consisting of heavy leathern thongs loaded with lead or iron, which were wound round the hands and forearms of the ancient pugilists to give weight to their blows. Owing to his great strength, Entellus, though an old man, was victorious. Dares, spitting blood and teeth, was carried off the field. A palm, the symbol of victory, and a bull, were presented to Entellus by the referee of the contest. Then we are told that Entellus led the bull into the middle of the arena, and dashed his hand, heavy with the cæstus, between the animal's horns; delivering the blow with such force that it broke the frontal bone and killed the poor beast instantly.

Trained men have successfully pitted their strength against horses. One strong-man boasted his ability to hold any team of horses in the world, while standing. He performed the feat thus: He would stand between the two horses, and make each pull in opposite directions; so that each horse aided him somewhat in holding the other. He tried many kinds of horses, but always made good his boast. He

declared that the plow horses were the hardest for him to manage.

Another strong-man had a ladder fixed flat on the ground; he would lie on this, face downward, with his arms extended straight above his head, his hands grasping an upper round, his feet braced firmly against one of the lower rounds. Heavy straps with hooks on the ends were then placed over his shoulders. When so fixed, a team of horses, attached to the hooks, could not pull him off the ladder. Of course, when the strain came, he would hold his arms and legs rigidly straight, so as to throw the strain as much as possible on the bones. I afterward heard that this athlete grew too ambitious, and came to grief. He boasted that he could hold the ladder against a yoke of oxen, and one day he made the trial. But the oxen's great weight was too much for him to bear; they pulled him off the ladder, and in some way injured permanently the biceps muscles of his arms.

Some years ago Sebastian Miller created a great sensation by breaking rocks, apparently

with his fist. But, strictly speaking, he did not break them with his fist. He would hold a stone slightly above another stone, and break it really by knocking it against the lower one.

When one compares the strength of *trained* men with the strength of animals, it is important to remember that bulk is by no means a criterion of strength. Quality of muscle is much more essential than quantity, men with a large amount of nervous energy being often able to perform feats far beyond the powers of larger and apparently stronger men. Man, *properly trained,* ought to be *proportionally* stronger than any other kind of animal; for great nerve force and superior intelligence should enable him to develop muscle of the highest possible quality.

XIII

EXERCISES FOR PROMOTING SYMMETRY AND REDUCING FLESH—DOES MUSCULAR DEVELOPMENT DIMINISH VITALITY?

TO correct an evil we must first know its cause. In the last chapter I remarked that, while man necessarily does heavy work with the muscles *below* his waist, he, as a rule, exercises only lightly the much more numerous and important muscles *above* his waist; which unequal division of labor insures the lower limbs becoming strong and shapely, and the body and arms remaining soft, weak, and so covered with fat that their natural symmetry is almost wholly lost. But before discussing what are the best exercises for promoting symmetry and reducing corpulency, it will be well to premise certain physiological principles involved in the phenomena of work.

To begin with: Oxygen is the great destroyer of fat. This important gas is taken

into the lungs with every breath one draws; there to be absorbed by the blood, which afterwards flows to the muscles, particularly to those being most vigorously used. Now, as the great function of oxygen in the animal economy is to burn up fat, it follows that a deficient oxidation of the tissues is, probably, the principal cause of overfatness; blood containing but little oxygen allows fat to accumulate.

A second fact necessary for us clearly to understand is, that muscles consume themselves and their surrounding tissue, to a certain extent, while working. Chief among the waste products of this combustion is carbonic acid, which, being deadly, must be eliminated quickly by the lungs, and oxygen must supply its place. The amount of carbonic acid formed will be proportional to the intensity of the muscular strain; also, because fat is the least stable of a muscle's constituents, soft muscles surrounded with much fat will possess a greater potentiality for making this gas than will well-conditioned muscles.

It sometimes happens, when muscular work

is both severe and prolonged, that carbonic acid forms with such rapidity and in so great quantity that the lungs cannot eliminate it quickly enough; in which case the condition known as breathlessness or auto-suffocation is produced. But the lungs, like other organs, can be developed by gradual training so that they will be able to eliminate without distress large quantities of the deadly gas, and to take in an equally great amount of life-giving oxygen.

Hence it is of the utmost importance first to increase the lung capacity of all corpulent persons; particularly as such persons have, usually, small lungs and weak voices; their breathing, ordinarily, is shallow, and even slight exertion "winds" them.

During exertion, the volume of air taken into the lungs is vastly increased, and the circulation of the blood is much quickened, as, loaded with a large supply of oxygen, it flows to the muscles, nourishing them, while it, at the same time, burns up and carries away particles of their fat.

In a subject who begins to exercise sys-

tematically, excessive oxidation occurs within the tissues, until the relation of their constituent parts becomes normal; that is, when the proportion of fat to flesh is correct; for healthy muscles should be surrounded with, and should contain, a certain quantity of fat. When such a proportion is reached, and only then, do muscles attain their proper symmetry. Obesity is nothing else than a greater or less obliteration, by fat, of the symmetry of muscles.

It should now be clear that the only natural, and the best way to reduce obesity is to exercise; the first effect of any exercise being to deepen and to accelerate the breathing.

I speak thus positively, although I am well aware that, at present, the preferred method for reducing flesh is "dieting." But dieting is neither a radical nor a natural cure for adiposity. Dieting deprives the system of its proper nourishment,—impairs the digestion, by accustoming the stomach to digest merely certain kinds of food, and these only in small quantity,—weakens all the organs, which should be continually supplied with rich blood,

—and, what is most important of all, not only fails to assist the eliminating organs to get rid of waste products, whose presence in any considerable quantity in the system is alone sufficient to cause ill-health, but actually renders the actions of such organs still more sluggish.

The importance of this last observation is obvious when we consider that most obese persons eat little; thus proving, in their case at least, obesity to be due, not so much to excessive assimilation, as to defective action on the part of secreting and excreting organs. (Here it is not meant that obesity is due *solely* to defective eliminating action; it is also due largely, as has been shown, to deficient oxidation.)

One other point: The reduction of flesh brought about by dieting has the great disadvantage of being, not radical, but temporary; and can be maintained, for even a short time, only by a rigorous abstinence which is disagreeable, unnatural, and hurtful.

That small wiry persons are, as a rule, longer lived than are stout and *apparently*

healthier folk, is notorious. The following may explain why. The thin are, usually, large eaters; that is, they ingest daily a large quantity of food. But little of this can remain as waste product, for the subjects do not become fat. What then becomes of it? Assuredly it must be burned up to supply energy,—thin persons are usually energetic,—and its waste products must afterwards be completely eliminated. On the other hand, the systems of fat persons are choked with waste products, which degenerate the more the longer they remain, until they at last produce divers diseases that carry the subjects off prematurely. So I repeat that, for the obese, exercise is much more beneficial than dieting, if only for the reason that the former strengthens, while the latter weakens, the organs of elimination.

The *initial* cause of the phenomenon of movement, no one understands; indeed, who solves it will know the Mystery of Life itself. We know, however, that when the brain wills that a weight be lifted, or even that a finger be moved, it transmits its order to the muscles

through the nerves, which instantly stimulate the former to make the required effort. We know further, that the resulting display of force or movement is due to the transformation of heat into energy; and, lastly, we know that not all of the combustion which takes place within the muscles is transformed into energy; there is a residue, a waste product, analagous to the ashes produced when coal burns.

An important fact, which I would have my readers remember, particularly when I discuss the question as to what are the best exercises for reducing corpulency, is that *when muscles are used they attract to themselves blood in greater or less quantities according to the degrees of intensity of their contractions.* This principle, the truth of which has been practically demonstrated by F. Lagrange, we cannot satisfactorily explain; but we know that the more effort a muscle makes, the more blood it needs to make it; and that the blood responds to this need.

The function of the blood which bathes exercising muscles is, as has already been said, a

Plate XXIV. HOME CHEST-EXERCISE —DOWN.

double one—it integrates, and it disintegrates; in other words, it deposits within the muscles the nutriment which it contains, to take the place of old material which it has burned up with its oxygen, and which it afterwards carries away. But the combustions which take place within muscles are greater as the amount of oxygenated blood which bathes them is greater. Hence the destruction of fat in and around muscles subjected to much strain will certainly be greater than would be the destruction of fat in and around muscles subjected to only slight strain.

If we now bear in mind the fact that, in man, the legs do heavy work, while the body and arms perform, generally, only light work; recollecting also the physiological law that, during exercise, a great quantity of highly oxygenated blood is drawn, as by a magnet, to those particular muscles which are undergoing strain; and, furthermore, if we remember that the more strain there is, the more blood is attracted to the parts bearing it;—we can readily see why the lower limbs of most men

are much more sinewy and shapely than are their bodies and upper limbs.

Considering the above principles, it seems most strange that light exercises should be especially recommended as a correction for human asymmetry; and that such exercises should form the basis of nearly all the systems of physical culture.

Any exercise, vigorous enough to necessitate considerable effort, particularly if it be continued to the point of breathlessness, is useful in the treatment of obesity.

If a fat man wishes to reduce himself by means of exercise, he usually runs. Now running makes one perspire copiously; it strengthens the heart, quickens exceedingly the circulation, thereby stimulating the action of all the eliminating organs; and it increases the lung capacity as much as, if not more than, any other exercise.

In so far, therefore, running is useful in cases of obesity. But it is not all-sufficient. Running *alone* will not produce general symmetry; for, the leg muscles *only* being called

Plate XXV. HOME CHEST-EXERCISE.—UP.

into vigorous action by this exercise, most of the blood flows to the lower limbs, which, consequently, increase in muscular tissue and lose fat, whereas the body and arms, not being vigorously used, increase hardly at all muscularly, nor, because we know combustion to be least active around idle muscles, do they lose permanently much fat. It is true that they lose some fat, the circulation having been generally quickened; but fat, when not replaced by muscle, has a strong tendency to re-form.

Hence, if one would become generally symmetrical, he must supplement running with other equally vigorous exercises, which will involve the many great muscles above the waist. A man should learn to climb a rope, or the under side of a ladder, hand over hand, without using the legs; to perform dips or jumps on the parallel bars, and to handle weights near to the limit of his strength. In Chapters III. and V. I described these exercises in detail.

But much hard work can be done without having recourse to apparatus. The extremely

obese, or those who have no ambition to be gymnastical, can still become well-proportioned, provided only that they will exercise in accordance with the principle that equally vigorous contractions of all the muscles tend to equalize development, and, hence, to promote symmetry.

As most of a stout person's fat accumulates about the abdomen, abdominal exercises, to draw large quantities of oxygenated blood to that part, are important. Here are two:

First. Lie flat on your back on the floor or in bed, and, after placing the toes beneath some sufficiently firm object, rise slowly to a sitting posture; then sink slowly back. Repeat until tired.

Second. Lie as before, but with the feet free; now raise the legs, extended straight, slowly up, back and over the head: bring them down again slowly. Repeat until tired.

Another home exercise, as excellent for the triceps, chest and wrists, as for the abdomen, is to support the body, maintained rigidly straight, face downward, above the floor, by

means of the hands and toes; now, allowing the lower point to do duty as a fixed fulcrum, bend the arms, until the chin touches the floor; then push up to straight arm again. Repeat until tired.

Speaking generally, I should say that any kind of *hard* work is beneficial, whether it be performed with or without the aid of specially constructed apparatus, in a gymnasium or out of it; but that that work will be *most* beneficial that involves muscles which are ordinarily little used; for, inasmuch as everyone in health necessarily uses his lower limbs frequently, exercises for these latter often only aggravate an unequal development which it should be our aim to correct.

Digging a trench, shoveling coal, moving furniture, carrying loads, being general exercises, are all excellent for the health, as well as for the general strength; but that kind of work is inconvenient for many, and may be practiced habitually only by those who earn their living thereby.

I once read in a newspaper the case of a

millionaire who became a motorman because he thought the vigorous open-air exercise of running a modern trolley-car would benefit him. Undoubtedly it did; yet he need not have put himself to so much trouble. Had he procured instead a few iron dumb-bells, learned how to use them, and then exercised with them intelligently, he would have acquired more easily, and within a much shorter space of time, that toughness of physique and robust health which make common laboring men, in this regard, enviable objects to the sedentary classes. Handling moderately heavy weights is laborious work; but there is health, if not wealth in it.

The advantages dumb-bells possess over apparatus are many. Easily portable and occupying but little space, they can be kept in one's own room where they may be used conveniently at one's leisure; and the busiest man has some leisure, if only at the time he retires. Again, the stout and inactive who would find exercises with apparatus difficult, can easily learn how to handle dumb-bells. Lastly, and this is their

chief advantage, dumb-bells may be of sizes to suit particular strengths.

First curling, and then putting up, two heavy weights, simultaneously, is a general exercise that imposes considerable strain upon, and therefore develops greatly, *all* the important muscles in the body.

How nearly equal the distribution of this strain is, a brief analysis of the different parts' share in the above exercise will show. In the first half of the movement—the whole movement is described on page 72, which see—the dumb-bells are raised from the floor to the shoulders by almost equally vigorous contractions of the front and back muscles of the thighs, those of the calves, the muscles of the feet, the buttocks' muscles, the loin muscles, all the great muscles of the back as well as those extending from the tops of the shoulders up and along the sides of the neck, the biceps muscles, and the muscles in the fingers, hands, wrists, forearms, shoulders and chest. In the last half of the movement,—putting the bells up,—the abdominal muscles and the extensors

of the arms and shoulders, have their strenuous turn.

Thus we see the extended effect of curling and pushing two heavy weights simultaneously.

Now, because of the wide distribution and the intensity of the strain, the amount of carbonic acid gas formed during the above movement's performance is enormous; hence the destruction of fat and the subsequent general oxygenation of the entire system must be equally enormous. Moreover, it cannot be supposed that the heart and lungs, the prime ministers to the tissues, do not participate in a strain to which a so great number of muscles are subjected; therefore, those organs, so long as the strain remains physiological, must also be largely developed and strengthened.

Of course, if the strain be too great, it becomes overstrain, which is hurtful and always dangerous. So, as much care should be taken that the weights be not too heavy, as that they be not too light.

Provided, then, that the weights be not beyond, nor too much below, the strength of the

subject, the foregoing simple movement would seem to be almost unparalleled as at once a reducer for the too fat, a developer for the too thin, and a promoter of general strength and symmetry.

Some may object that this movement as a flesh-reducer has one disadvantage, namely, that, because of the weights being heavy, it could not be continued for a sufficiently long time. In lieu of arguing the point, I would advise any such objector to use only moderately heavy weights, with which he can repeat more frequently; for I may say here, in order not to be misunderstood, that it is far from my intention to advise all, indiscriminately, to use extremely heavy weights; rather I wish at present merely tc make clear a principle, while leaving its application to the reader's judgment. Nevertheless, I will admit that the possible objection has some validity, and concede that, for the special purpose of reducing flesh, a happy medium in the application of the principle would be at least of great benefit; that is to say, the weights need not necessarily be

extremely heavy. I maintain, however, that they must be moderately so, would they be in any great degree effective.

Chest-weights are likewise valuable as developers of strength and symmetry. They are convenient in that they may be affixed to the door-case in one's own room. In a certain make two handles are connected with but one pulley, the weight on the end of which slides along two copper poles. This machine is simple, excellent and cheap; and, when put up, occupies a space of less than one foot in width.

In the third chapter I described several important movements with the above apparatus; but there are many more which may be easily learned from any of the illustrated pamphlets on chest-weight exercises.

Again I would warn my readers, if they wish to derive benefit from the exercise, not to pull weights which are too light; for doubtless there will be many, physical culturists included, who will declare that the arms should not strenuously exert themselves; which same men will, in the next breath, recommend running,

it not occurring to them to explain their inconsistency.

The *coup de maître* of light-weight enthusiasts is the assertion that light weights used for a long time will *tire* the muscles; and they argue that from this fatigue development will necessarily result. But, as was shown in the first chapter, the fatigue caused by many slight muscular contractions results in very little development; the muscles that acquire great strength being only those which are made to contract with much vigor. If it were true that any exercise which produced aching fatigue would make muscles strong, then women, who several times each day go through the strenuous "exercise" of combing and arranging their hair, would be extraordinarily strong; for this "arrangement," requiring as it does much time and continued slight effort, is certainly fatiguing. Girls who work as "winders" in ribbon factories, and whose arms are therefore actively "exercised" for ten hours each day, unquestionably derive more harm than benefit from this cruel substitute for calisthenics; nor

can such harm be wholly the result of their breathing vitiated air—most factories being fairly well ventilated; hence must it result mainly from the torture of standing all day, the while employing the upper muscles in unremitting light toil.

No form of work that is followed by an insufficient period of repose can be physiologically beneficial. The greatest danger to devotees of light exercises lurks in the fact that such exercises may be continued to the point of almost absolute exhaustion, from which it is extremely difficult, besides requiring a long time, fully to recover. In the case of the factory girls just alluded to, a new day's work is begun before the effect of the previous day's work is *fully* recovered from. This, to my mind, explains why they so quickly fade.

After the abdominal exercises, and the hard and rather slow work with the chest-weights and dumb-bells, obese subjects should not omit taking some kind of quicker exercise to promote perspiration such as, fast walking, run-

ning, hand-ball, boxing, or fencing. Many outdoor athletic sports are useful to reduce corpulency. Home exercises for this purpose are: Running upstairs several steps at a time, and punching a canvas bag hung in an open doorway.

My reason for combining lighter exercises with heavy work, in order *most effectually* to reduce weight, is this: Heavy work, necessitating as it does intense combustions within and around muscles, results in the formation of much waste product; the which active exercises stimulate secreting and excreting organs quickly to eliminate.

Among the appurtenances to gymnasiums, which I have not yet mentioned, is the "medicine ball." This is made of canvas, and may weigh from four to sixteen pounds. One individual tosses it to another from various positions: With two hands, from above the head, or from between the legs; with the right arm alone, and with the left arm alone; or the player may turn halfway around, and throw the ball backwards above his head. The medi-

cine ball's chief virtue lies in its being a general exercise affecting in a nearly equal degree *all* the muscles and organs. See Plates XXVI —XXIX.

I met at a gymnasium one day a man who looked to be about fifty years of age. He was five feet ten inches in height, well built, and, I should judge, weighed about one hundred and eighty pounds. He said that as a boy he had been thin; but stoutness came with age, and also ill-health. Then he began to practice with dumb-bells, and, by gradual training, learned to put up quite heavy weights, either with one hand, or with two hands. He also practiced abdominal exercises, wrestled, boxed, and played hand-ball. He declared that, within two years, these exercises combined had reduced his waist-girth twelve inches, and had given him a symmetrical figure.

Thus a powerful, shapely, and healthy man was made out of a weak, fat, and sickly one. When we consider that this subject was fifty years old and in bad health when he began his physical training, we are irresistibly reminded

Plate XXVIII. A THROW FROM THE ARM.

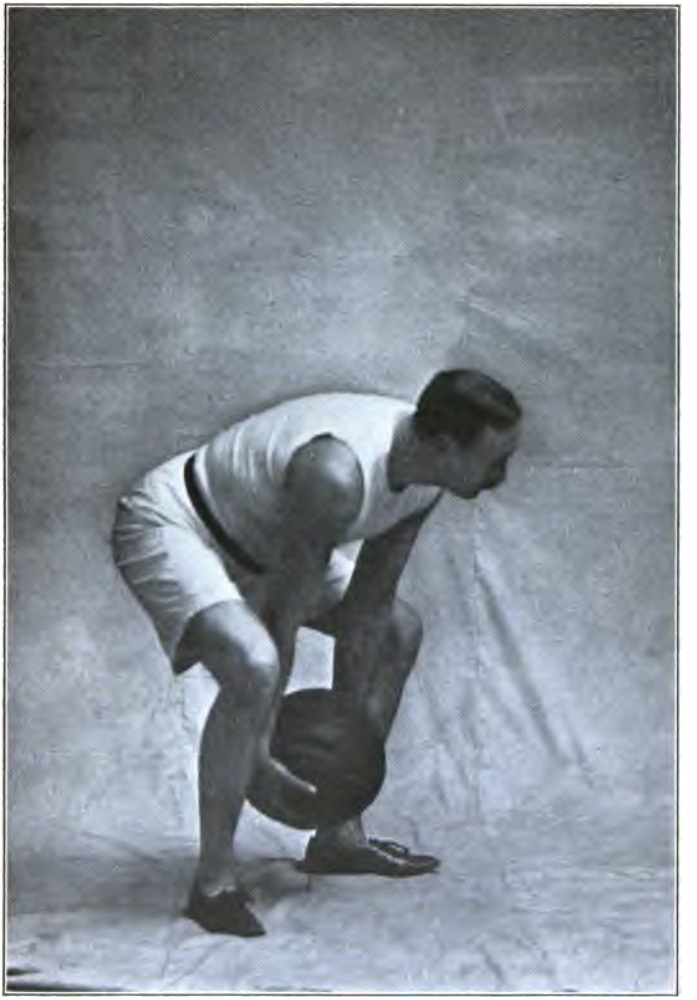

Plate XXIX. A THROW FROM BETWEEN THE LEGS.

of the old saying, " While there is life, there is hope."

Before concluding this chapter I would add a word concerning the popular belief that excessive muscular development diminishes vitality. That it does so in many instances cannot be denied; *but such instances occur only in those subjects who by special, localized work have developed merely certain muscles.*

Modern athletics tend toward this end. Runners perform no physical work but running; jumpers only jump; weight-lifters put up weights, and neglect exercises having a more direct effect upon the lungs and circulatory apparatus. Hence are certain parts developed at the expense of other parts, thus making weak links in the chain upon whose *whole* integrity human existence depends.

And this is not the sole danger of an uneven development. Great strength in some parts is apt to engender over-confidence in one's whole physique; as when a man with powerful muscles and a weak heart attempts a feat requiring

much strength. Recollect that, however strong a man may be *apparently,* he is truly no stronger than the weakest part of his anatomy; and that, if he develops certain parts of his organism without, either at the same time, or at some subsequent time, developing equally well all other parts, he is actually in a worse case than if he had done no hard work of any kind; for when the organism is disturbed by a localized violent exercise, its general circulation is deflected thereby to the involved parts, and thus it does not develop in its *entirety* as well as it otherwise would were it left undisturbed.

On the other hand, I can say positively that any kind of *general* hard work, requiring for its performance action on the part of *all* muscles and organs, so far from *diminishing* vitality, increases it to a wonderful extent.

Frequent intense demands upon vitality or nerve-force, when not too frequent nor too intense, eminently increase its formation.

From these several considerations we may see how much more important than the excessive development of *some* parts, is the cultivation of an equal strength in *all* parts.

XIV

A PARALLEL BETWEEN MENTAL AND PHYSICAL CULTURE, WITH OBSERVATIONS ON THE VALUE OF EFFORT

HOWEVER diverse may be the methods of mental education, the fundamental principle of this important branch of culture is universally understood and approved: It is *effort constantly progressing in intensity.* Mark *intensity* as distinguished from *amount* of work. A green brain, incapable of intense effort, is encouraged to make slight efforts; then greater efforts—not a greater number of slight efforts. A child learns its letters, then to read and to write; to spell simple words, then harder words; to do easy sums, then those which are more complex; until finally its constantly growing brain may master the intricacies of the higher mathematics, several languages, philosophy, chemistry, and other sciences.

Who would dream of advising a child to do only that mental work which it could do easily, and to continue it, for the purpose of development, until its brain became tired? Every sane person knows that could the brain of a human be restricted to the making of slight efforts only,—which, happily, under ordinary conditions, would be impossible,—the victim, when grown, would be a pathological case of what doctors call "arrested development."

The watchword of the mental culturist is *try*. If a schoolboy complains that he cannot solve a problem, his teacher, before helping him, will advise him to "try once more *as hard as he can* to do it himself."

Because none involves effort, all forms of mechanical work tend to paralyze the mental faculties. Bookkeepers, and the like, rarely possess much intellect. To learn bookkeeping is an effort; to practice it is mechanical. On the other hand, statesmen and financiers, who grapple daily with more and more complex problems, thus straining their brain-power frequently to its utmost capacity, become veritable

intellectual giants, fit to rule wisely over millions of human beings, to direct many of the complicated affairs of government, or to control the hundreds of millions of dollars involved in big corporations.

So we conclude that it is not the *quantity* of work which the brain does, that develops that organ; it is the *intensity of mental effort.* But the brain is essentially as physical an organ as is a muscle; therefore, if intensity, and not number of efforts, develops the one, intensity, and not number of efforts, must also develop the other. The maxim, "What is easy to do is of little benefit," may be applied with equal truth either to physical, or to mental work.

The degree of intensity of mental effort determines the amount of blood which flows to the brain. This is well shown by F. Lagrange ("Physiology of Bodily Exercise," p. 345.) He says: "Mosso, an Italian physiologist, has constructed a balance on which a man can lie at full length. When a man is the subject of experiment the apparatus is so counter-

poised that the part which supports the head and that which supports the feet are in exactly the same horizontal plane. The sensibility of the balance is sufficiently acute for a very light weight, added to one side or the other, to destroy its equilibrium. If the person under observation lies down perfectly motionless, and in absolute mental repose, the two extremities of the balance remain at exactly the same level. But if his mind becomes occupied with ideas needing an effort of attention, if an endeavor is made to solve a difficult problem, if a call is made on the memory or the judgment, if, in short, the active psychical faculties come into play, the equilibrium of the balance is immediately destroyed, and the end which supports the head sinks.

"The blood flows in more abundance through the cerebral vessels by the very fact of mental effort: the brain suddenly becomes heavier, and this increase in weight gives the exact measure of the increase in blood-supply. *We may in this manner determine that the lowering of the head is more marked according*

as the psychical faculties are more strained." In my own experience I have noticed that, during severe mental strain, the head becomes hot and the cheeks flushed. Mild cerebral effort has not a like effect. The above exemplifies the analogy between the modes of brain work and muscle work; for it has already been shown that the amount of blood-flow to a muscle is equally determined by the degree of intensity of its contraction.

That physical educators, unlike mental educators, have not recognized the immense value of intense effort, is attested by a physical recession which, when compared with our great mental advance, is startling. Modern achievements of mind excite us to wonder. We build railroads through the bed-rock of cities, span rivers with marvelous suspension bridges, harness cataracts to motive great factories; we invent cannon to hurl ton-projectiles ten miles, make machines that talk, and those that navigate the air, transmit messages thousands of miles by invisible media; and many more marvels we do. But *physically* what are we?

Inferior to beasts. We are content that the lion should be stronger, the eye of the hawk keener, the scent of the hound more acute; but should we also be content that primitive man excelled us?

Inasmuch as our ancestors unquestionably saw better, heard better, and were stronger than we are, the following question is pertinent: Why, instead of retrograding, have we not *advanced* as much physically as we have mentally? I answer: Because intense mental efforts have been universally more constant than intense physical efforts. Again, our mental efforts for generations have reduced the *necessity* for physical efforts; so, in proportion as the former have increased the latter have diminished.

When man worked less hard mentally, he worked harder physically. To preserve himself from his enemies, his eyes needed to be keen, his hearing acute, his strength great; and all these he constantly cultivated by intense efforts. Striving to discern minute objects far distant develops the sense of sight, in the

same way that straining the ears to catch slight sounds develops the hearing.

To progress physically, use of parts is not sufficient, nor is mere exercise, even if continued to the point of fatigue; *strenuous effort* is absolutely necessary.

The fact that the jaws and teeth of primitive man were much larger and stronger than are those parts in men of the present day, well illustrates how profoundly *less intense* use affects development. Man still uses his jaws and teeth, but not so strenuously as formerly.

Of course, in the above special case, it has been much to our advantage to have retrograded; but this is not true of many other retrogressions. Dull hearing, poor eyesight, weak muscles, feeble organs, and puny resisting power, are distinctly not advantageous.

That all animal life is dependent on effort, is as true as that the possibility of effort depends on God; and further, observation proves that in proportion as the efforts of a part are intense and constant,—within certain limits,—so is the life of that part enduring and vigorous.

It is well known that the minds of men develop long after their bodies have passed into what is called the decline of life. This is so, because even the average mind is, ordinarily, more constantly active than are the muscles; and this constant activity, at whatever age, rejuvenates and strengthens.

In the generality of cases this principle would hold good as regards muscles; for, when men of advanced age have undergone unaccustomed hard physical work, they have increased considerably in strength. In the face of this fact persons ask, "At what period of life should one abjure hard exercise?"

It seems reasonable to infer that did men at all times use their *entire* bodies as constantly and vigorously as they habitually use their minds, their physical and mental strength would endure equally.

Herbert Spencer, when more than eighty years old, wrote "Facts and Comments." His body which, from his own confession, he did not believe in subjecting to hard work, had always been feeble. During the latter

years of his life he was bedridden. He died in the year 1903, with a *mind* clear and strong to the end.

One frequently finds alert minds in the aged; rarely alert bodies. No one knows precisely how long a vigorous mind might live; its spark is too soon quenched by its feeble tenement. For all we know, *intellectual* life might endure for several hundred years.

When those who do much brain work declare they have no time to cultivate their bodies, they speak thus, not because they forget that the precious brain depends on the despised body for its nourishment, but because no physical culture system has as yet thoroughly demonstrated to them its worth-whileness. Modern exercise methods have apparently borne little fruit; and what men do not see, they will not believe. Athletes often live no longer than other men, chiefly for the reason I have already stated, namely, that their localized work develops only the muscles affected, *at the expense* of muscles not affected, and, what is more serious, at the expense also of *organs,* upon

whose perfect integrity life depends. Again, a man who has greatly developed his arm or leg muscles by localized work, and who has not correspondingly developed his heart, would, in all probability, more quickly wear out the last-named organ, by a series of overstrains, made possible by the disproportionate strength of his limbs, than would a man whose organic strength was predominant.

But, however this may be, vicious systems should blind no one to the transcendent importance of *proper* bodily culture. If we succeed eventually in scientifically prolonging the life of the body, by means of a great and nearly equal development of all its muscles and organs, so that, after many generations, it might equal the present life of mind, what a great thing we shall have accomplished! Powerful organs, within perfectly harmonious bodies, would minister to proportionately great intellects, whose undertakings would puerilize our greatest mental achievements heretofore. And how wise might men become had they perhaps twice the number of years they have

at present, in which to acquire knowledge and to create! This will not be, however, until man fully realizes that his physical efforts must equal the enormous mental efforts which he has conscientiously and unswervingly put forth since time began.

When, after centuries of battle, the Romans had conquered all their immediate enemies, Cato put this profound question to his countrymen: "What is to become of this Rome of ours after she shall no longer have any state to fear?" Cato meant that when effort became unnecessary, effort would cease; and this would mean gradual progressive atrophy of mental, physical, and moral powers. The Fall of Rome was actually due to this threefold decay, brought on by the surcease of effort.

Now when physical culturists advocate light exercises, in the stead of strenuous exercises, they are really pleading against the mainspring of all progress—effort.

It is because of this peculiar advocacy, by those who, above all others, should know better,

that the physique and health of man, so far from having improved during past generations, have retrograded.

This grand law will be found constant in all organisms: Intense use produces great development; moderately intense use, moderate development; little use, little development; while parts not used at all atrophy into mere useless rudimentary appendages.

It may be said generally that, in the struggle for existence, all animals prey upon, or strive to displace, other animals. Why does this arrangement exist, if not for the reason that the constant physical and mental efforts involved in seeking to escape, as well as striving to overcome, by either strength or strategy, or by both, are the best possible means, according to the laws of physiology, for developing the multifarious attributes of the whole animal kingdom? During the process, some die for the ultimate good of the many; thus weaknesses are eliminated.

As the above conditions *are* true of animals, they *were* true of primitive man; *now* man's

struggle for existence lies much more in mental than in physical competition. The result is only what might have been anticipated from our theory: man, by increasing mental effort and decreasing physical effort, is becoming metamorphosed into a mental giant and a physical dwarf.

The principle of inheritance has an important bearing on physical culture, for, through it, we realize that to develop our brains and bodies is not merely a selfish duty; it is much more a duty we owe to posterity. While the strength of each individual is limited, the ultimate strength of man is limitless. So long as we strive, we improve; and though we reach our individual limit, through a disability further to strive, yet do we transmit to our progeny the potentiality of our developed attributes.

What limit has mentality? Apparently not any; for we are advancing in that respect now more rapidly than ever before, and we expect to keep up this advance as long as mankind endures.

Who then would set limits to our physical

advance? We should develop as fast physically as mentally; and this we can do, provided we make our physical and mental efforts equally intense.

Health is, after all, a mere question of strength; no part being unhealthy which is strong. Bearing in mind that any weak part is prone to become diseased and that, therefore, *one* weakness in the human machine may be fatal, every man should cultivate *balanced* strength rather than showy local strength. If one's lungs are weak, one should shout, sing, and perform exercises that produce breathlessness. So with the heart and other parts of the body, the principle being to make the weak part work a little, then moderately, and at last vigorously, when it will of necessity become strong. Thus may all weaknesses and their consequent diseases be one day completely eliminated. A consideration of the above remarks ought to make all realize the supreme importance of *proper* physical culture.

How many mental giants have broken down from mental overwork solely because they

wanted physical stamina! For the sake of minutes, they have lost valuable years. How much more of useful work could they have accomplished had they troubled to build up physiques sufficiently strong to have carried it on! Nor is this all. Physically incapable, they have frequently been unable to beget children who might have inherited their mental vigor.

Darwin remarks: * "More individuals are born than can possibly survive. A grain in the balance will determine which individual shall live and which shall die,—which variety or species shall increase in number, and which shall decrease, or finally become extinct. . . . The slightest advantage in one being, at any age or during any season, over those with which it comes into competition, or better adaptation in however slight a degree to the surrounding physical conditions, will turn the balance."

If the above be true, if so slight causes operate so mightily, how much more certain

* "The Origin of Species," page 406.

should we be that beings, whose organic and muscular strength have been developed by the proper kind of exercise, will have a better chance of surviving than will those who have allowed many parts of their physical organizations to deteriorate through disuse. And mental giants—beings who are the most useful to humanity—are the very ones who take the least interest in the cultivation of the body.

Again, Darwin says: "The most vigorous individuals, or those which have most successfully struggled with their conditions of life, will generally leave most progeny."

Hence it is that, while physically well-balanced stupidity propagates myriads of its kind, the indifference of brain-workers to their general physique militates against a high mentality being often inherited.

That brain workers frequently break down from overwork is largely due to the fact that they develop one part—the brain—excessively and to the exclusion of all other parts. The universal nourishing agent, the blood, is monopolized as it were by one organ; and we

have seen by the law of Balancement of Growth that such monopoly by any part or parts entails suffering on the rest of the system.

A physical culturist with common sense once remarked to me that he had never met with a case of overwork occurring in a subject who strove to develop *all* his muscles and organs by a variety of exercises. Atrophy of a part, which sometimes results from its excessive exercise, never occurs when many other parts are at the same time, or at subsequent times, equally as well exercised.

The fact that all muscles and organs possess a latent potentiality for development is a wise prevision. By virtue of it, different parts become capable, if the necessity arises, of performing successfully other work in conjunction with their own. Thus when certain parts of the organization are injured or rendered permanently incapable, other parts—thanks to the development consequent on the greater amount of labor thrust upon them—can still maintain the body in a fit condition. The

extraordinary development of the sense of touch, consequent on blindness, is a familiar example of the working of the above law.

We come now to the effect of effort on the nerves and nerve-centers. Previous to discussing this question, however, it will be necessary for us clearly to understand the general working of the nervous sytsem.

Alex. Bain, in his great work, "The Senses and the Intellect," compares the nervous system to "an organ with bellows constantly charged, and ready to be let off in any direction, according to the particular keys that are touched. The stimulus of our sensations and feelings, instead of supplying the inward power, merely determines the manner and place of the discharge."

Nervous force is a mysterious something within us that is the source of all the energy of our entire being; upon *it* life absolutely depends. This force manifests itself least during sleep, stimulating only the muscles concerned in the organic processes, such as those of respiration, circulation, etc.

In the awake state, energy, when not present in excess, may still remain quiescent in so far as not to stimulate *voluntary* muscles to any considerable action. But recollect that this energy, being constantly formed by the chemical changes always going on in the system, cannot thus contain itself for long. After an organism has remained comparatively still during a certain period of time, the "steam" within it, which has been all the while accumulating, reaches its acme and seeks to escape; at which point the system experiences any overpowering desideration for movement. It is this power that awakens us after a night's rest. A healthy child forcibly kept quiet, as in school, soon becomes restless, owing to its accumulation of nervous energy. For the same reason, a horse that has been pent in the stable for several days, will, when taken out, prance, rear, and often try to run away.

The above illustrates nervous force merely as it is spontaneously manifested. When stimulated by the will, its great power is of course much increased. Here it might be well to de-

fine exactly what stimulus of the will means. The great nerve-center of all stimuli is the brain; and there will-power orginates. The direct stimuli of the will are desires developed from ideas. In the conscious state the brain teems with ideas, any one of which is apt to become a desire; in fact a desire is nothing more than a very strong idea. Now every desire has a powerful tendency to act itself out; and this it invariably strives to do through the medium of the will. In fine, thoughts beget desires which the brain, as master of the body, calls upon its servants—the nerves and muscles—promptly to satisfy.

If a man sees, and strongly desires to lift, a heavy weight, for the moment this desire dominates; it is therefore promptly acted out by the emanation of a powerful impulse from the brain to the nerves which, in their turn, stimulate to a sufficient degree the muscles proper to perform the demanded action.

It is popularly supposed that the will dominates, or at least should dominate, our ideas or desires. The contrary of this is true.

Desires are the absolute masters of the will, and on them the will waits. The erroneous notion that the will is ever stronger than a desire, comes from a wrong conception of what will is. Will is the mere expression or manifestation of some desire. Therefore, when we say our will has overcome, for instance, an evil desire, we really mean that some idea antagonistic to the evil desire has developed into the stronger desire of the two; and our eventual action accords with the stronger desire, be that good or bad.

We may now revert to the effect of effort on the nerves and nerve-centers. Everyone knows that not any muscle can contract, even in the smallest degree, without a stimulus from its proper nerve. Cut a nerve, and you render the muscle or muscles with which it was connected powerless. It is well known also that the force of a muscle's contraction varies with the strength of its stimulus. From these facts, —the inability of a muscle to contract at all without some stimulus, or powerfully without a great stimulus—the importance of developing

nervous strength in connection with muscular strength is obvious.

That nerves are as susceptible of development as are muscles, and that they can be developed by the same means, namely, by effort, is certain. Bain remarks of this: "The muscles of the body are strengthened by growth; this growth is accelerated, if they are regularly exercised within limits; and the very same is likely to be true of the nerves and nerve-centers that dictate the flow and alternation of muscular movements."

But, as has been said of muscles, nerves which habitually make only slight efforts will not become strong. Many slight efforts will exhaust a nerve just as surely as a muscle without adding materially to its natural force.

It is physiological with all organic structures to be unable to do that to which they have not been accustomed. Hence it is as unreasonable to expect a nerve, habituated to slight stimulation, to stimulate powerfully, as it would be to expect a muscle suddenly to bear a strain many

times greater than any which it has ever borne before.

The method of developing nerve force is identical with that of developing muscular force—the progressive system of gradually increasing effort. In regard to the best exercises for cultivating nerve strength, it is necessary only to say that they are those which best cultivate muscular strength; for nerves and muscles, of necessity, work in unison, and powerful muscular contractions are not possible without correspondingly powerful nerve stimuli.

That *light* exercises call for *slight* efforts on the part of both nerves and muscles, everyone will admit; and these efforts, after a particular light exercise has become familiar, tend to become even slighter—at least as regards the nerves.

Bain thus expresses himself respecting the effect of *spontaneous* movements on nervous impulses: ". . . Spontaneous movements are without doubt confirmed by repetition, and are thereby made to recur more readily in the future. Any movement struck out by

central energy leaves, as it were, a track behind; *a less amount of nervous impulse will be required for its renewal.* By a spontaneous stimulus the hands are closed; the act of closing determines a curent or bent in that direction, and the next exertion is so much the easier.

Now, while the above quotation refers especially to spontaneous movements, voluntary movements, which are subject to the same physiological laws, must be affected in an identical way; and particularly is this so with voluntary movements representing a trifling expenditure of force.

It is well known that an easy exercise, involving frequent repetitions of the same movements in a fixed order, may be performed, as we say, mechanically; in other words, the movements tend to become reflex in their nature. The nerves' share in that kind of exercise is to stimulate the muscles slightly, at first, and still less as the movements continue. Thus it is apparent that light exercises, however prolonged, are as little useful for developing

nervous strength as for developing muscular strength.

The *value* of strong nerves can hardly be overestimated, for, as the nervous impulses—constantly manifest in the heart's beat, in respiration, in circulation, and in the continual untiring action of the various secretory and excretory processes—are stronger, so much the more thoroughly is the system invigorated and cleansed. On the other hand, with weak stimuli, the system soon wastes, decays and dies.

I once read somewhere an essay in which *enthusiasm* was declared to be the key that opened many doors to success. But to be enthusiastic is to be energetic, and no man can be truly energetic has he not good health and sound nerves. The dyspeptic is usually a pessimist, never an enthusiast. Mental achievement obviously depends primarily upon nervous and muscular integrity. Even moral health depends much on physical health, it having been demonstrated that criminality is due as well to physical as to moral weaknesses.

Therefore should our *first* duty be to strengthen *all* weaknesses by patient endeavor, or *effort.*

The objection has been raised that strenuous exertion, which I have declared the best mean for developing both nerve and muscle, has a blunting effect on the intellect. Let us examine into this. First as to the chemical changes which take place when the brain works. "The products of nervous waste are increased when the mind is more than ordinarily exerted. The alkaline phosphates (triple phosphate of ammonia and magnesia) removed by the kidneys are derived principally from the waste of nervous substance; and they are sensibly increased after great mental exertion or excitement. Phosphorus abounds more in the brain than in any other tissue." (A. Bain, "The Senses and the Intellect," p. 11.)

What insures that the products of dissimilation, especially abundant in the brains of brain-workers, shall be quickly got rid of, so as not to impede the mental function? *Exercise.*

The same author says on page 53: "The more immediate source of nervous power is an

abundant supply of blood. The arrest of the circulation in the brain, by stoppage of the heart, or by pressure on the head, is followed by loss of consciousness. On the other hand, excessive rapidity of the circulation quickens the thoughts and feelings, in other words, is productive of *excitement,* which may amount even to delirium. Again, as regards the *quality* of the blood, excess of carbonic acid, of urea, or of other impurities removed by the excreting organs, depresses or destroys the mental function; the same effect arising from deficiency of nutritive material. And, obversely, abundance of nourishment, the full exercise of the purifying organs, and the presence of the agents known as stimulants, by affecting the quality of the blood, impart exhilaration and vigor to the mental functions."

That strenuous exertion increases the rapidity of the circulation, thereby quickening "the thoughts and feelings,"—removes impurities, which "depress or destroy the mental function,"—and improves the quality of the blood, thus imparting "exhilaration and vigor to the

mental functions,—cannot be denied; hence strenuous exertion, so far from blunting the intellect, must much clarify it.

A brain nourished by the rich blood of those who do hard physical work ought, in the nature of things, to become more robust, and therefore capable of more and better work than one poorly nourished. That this is not always the case is due, not as is commonly supposed, to the fact that physical exertion blunts mental power; it is because hard physical workers are frequently not at the same time brain-workers: and I do not claim that use of muscle develops the brain, any more than I would claim that use of brain would develop muscle. But let brain-workers be also physical workers, and their mentality will assuredly be benefited through their increased physical and nervous force.

A potent cause of the breakdowns to which brain-workers are especially subject may be traced to an excessive accumulation of waste products—the invariable result of prolonged physical inactivity. Just what these products

are we do not know; but they are of the nature of putrefactive substances. Sometimes they are present in such quantity as to cause fevers of overwork resembling typhoid. This condition is an auto-intoxication. The remedy for it is plainly not rest, but gentle physical exercise, gradually becoming more vigorous; thus the brain may be most quickly cleared and the system renovated.

A word about rest. Like other good things, too much rest is good for nothing; more, it is positively injurious. But reasonable intervals of rest are necessary. In all forms of mental work the brain requires intervals of rest, as do the muscles when engaged in physical work. To work hard *steadily,* whether the work be mental or physical, is to expend more nervous energy than the system can afford at one time. It is as though we should take the bung out of a watering-barrel, thus allowing the liquid to run away faster than it comes in, and should keep it out until the barrel becomes empty. We replace the bung, and the barrel fills up again. Rest corks the nervous stream; when

the system re-accumulates sufficient energy for a fresh expenditure.

The amount of rest needed by different individuals depends upon the special constitution of each, and on the varying degree of rapidity that each makes energy. Generally, as a compensation, nervous temperaments which expend energy quickest, also manufacture it most rapidly. A nervous man quickly tires, and as quickly recovers.

It has been asserted that hard work uses up much nervous force, and hence is hostile to long life. So it does, but physiological processes are such that active demand stimulates active formation; therefore hard work is instrumental also in the *production* of nervous force, which is *favorable* to long life.

The principle contended for in this chapter may be thus summarized: As the brain, to attain its full development, must exert itself frequently *with its utmost intensity,* so the muscles and nerves, to attain their full development, must exert themselves frequetly *with their utmost intensity.* Hence,—if one's object be

development,—to train the muscles to bear only slight strain, is as absurd as if one should teach the brain only how to add up a column of figures.

It is the man of effort that amounts to something. If the merchant on one side of a street surpasses the merchant opposite, it is because, while one is satisfied that the dull routine of acquired knowledge in his particular line should remain mechanical, the other's faculties are constantly reaching out for new schemes to enlarge his particular routine. There is this difference between the two: the first ***uses*** his brain, the second *exerts* it.

An engineer possesses higher intellectual faculties than a bookkeeper, because the practice of the quasi-mechanical profession of the latter exacts far less *exertion* of brain than does the profession of the former, which has frequently to meet hitherto unexperienced combinations and conditions with new or original ideas designed to circumvent them.

It is equally true that men who perform easy physical exercises never amount to much, physi-

cally. In order to progress man *must* make efforts progressively intense. In strenuous effort, and in that alone, lies the secret of success; be that success mental, moral, or physical.

Perfection and simplicity are closely related. When a new machine is invented, it is at first a very complex affair; as its construction becomes simpler, it approaches nearer to perfection. Physical culture is not the complex subject that many would have it; on the contrary, it is simple. Muscles, to become strong, must be *vigorously* used—that is all. Moreover, general strength, *eo ipso,* produces robust health. What does the day laborer working with pick and shovel know of hygiene? Usually nothing; yet he enjoys health. The science of hygiene, to us of so great importance, seems to have been elaborated mainly for the purpose of keeping the delicate alive.

Far more important than hygiene is the study of "How to get strong"; and were it not for the many "professors" of methods that, professedly, will make one strong without working,—I mean the exponents of cal-

isthenics and light exercises generally,—there might be hope of our learning a *real* method for this purpose.

A laborer's pipe is so rank that to smoke it once would make an ordinary man sick; yet the hardy son of toil smokes it with impunity all day, beginning before breakfast. Very unhygienic, is it not? Not being able to afford wholesome food, he eats what he can get or whatever is cheap. Often his dinner consists of impure bread, rancid butter, sausages, and strong cheese; and he washes down this mixture with the greater part of a can of adulterated American beer. He has never been told to eat slowly and to masticate well; but he rarely suffers from indigestion, because his stomach is as strong as his muscles.

Now, while we all cannot work with pick and shovel, most of us can become as strong as, and even stronger than, one who does; and that with little trouble and less time. I reiterate what I have already said several times—that one-half hour three times a week of the *proper kind of work* will make almost anyone as

strong as the strongest laborer, who tantalizingly lives in health despite his notorious unhygienic living.

At first you may not be able to do *hard* work, especially with the ordinarily weak muscles above the waist; but let it be your aim to *progress,* that is to say, gradually train your muscles to contract with more and yet more force, until finally they become capable of considerable effort.

Common observation proves that it is not much work requiring many slight efforts, but much less work—as regards aggregate amount —requiring great efforts, that makes the best quality of brain and brawn.

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